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THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

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MANCHURIA

THE UNSEEN HERO OF THE GENERAL STRIKE

REPLY TO CERTAIN ALLEGATIONS CONCERNING LABOR CONDITIONS IN JAPAN

MANCHURIA IN TWENTY YEARS

THE NEW RAILWAYS OF MANCHURIA

PRELIMINARY PROJECT FOR CANTON OUTER HARBOR

HEAVY-DUTY GOODS LOCOMOTIVES

THE CONSTRUCTION OF THE YODO-GAWA OHASHI

MACHINERY MARKETS OF NETHERLANDS EAST INDIES

Vol. XXII August, 1926 No. 8

SHANGHAI, PEKING, TOKYO AND MANILA

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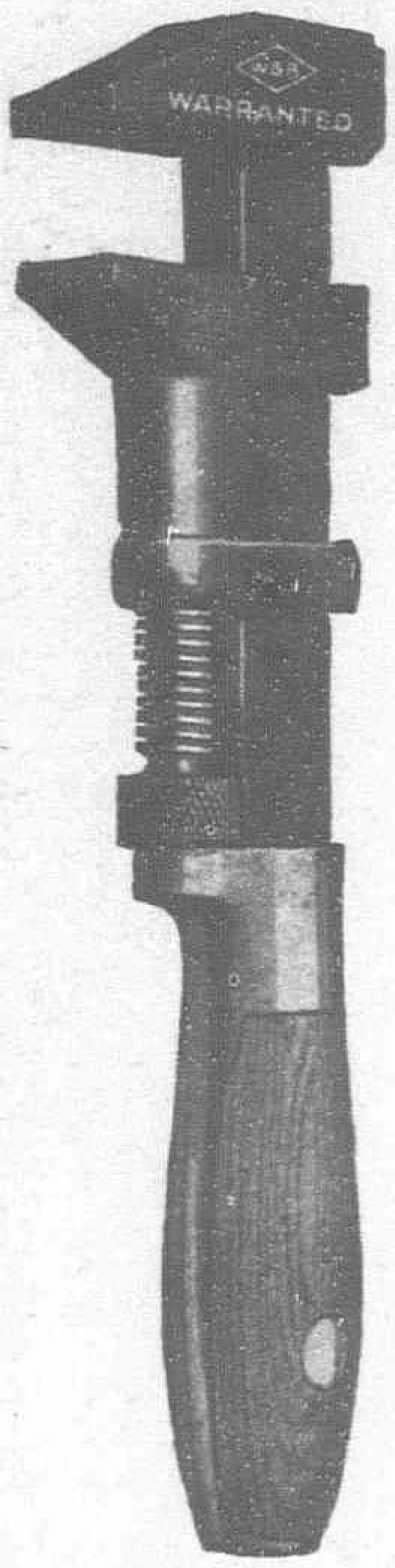

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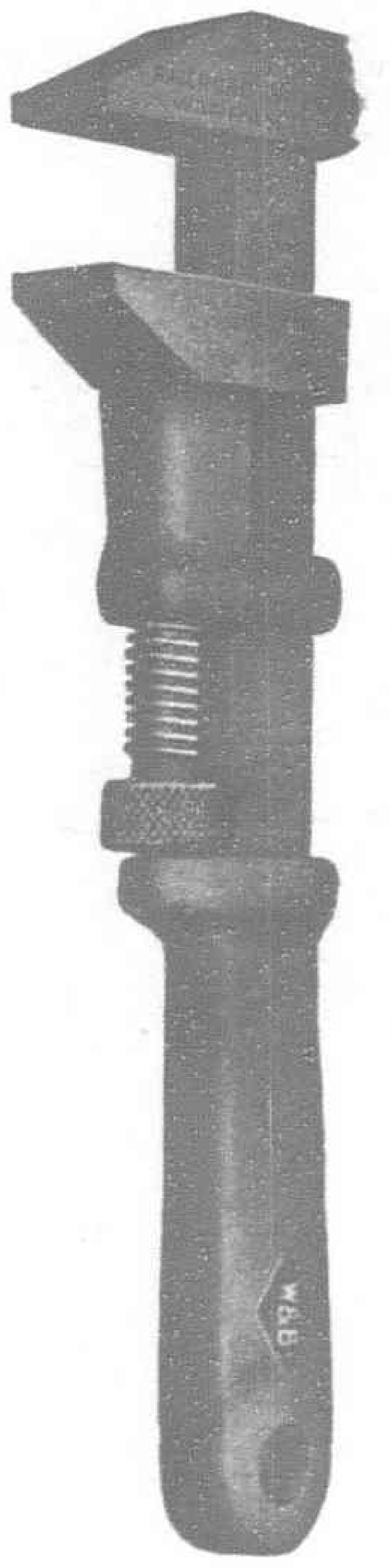

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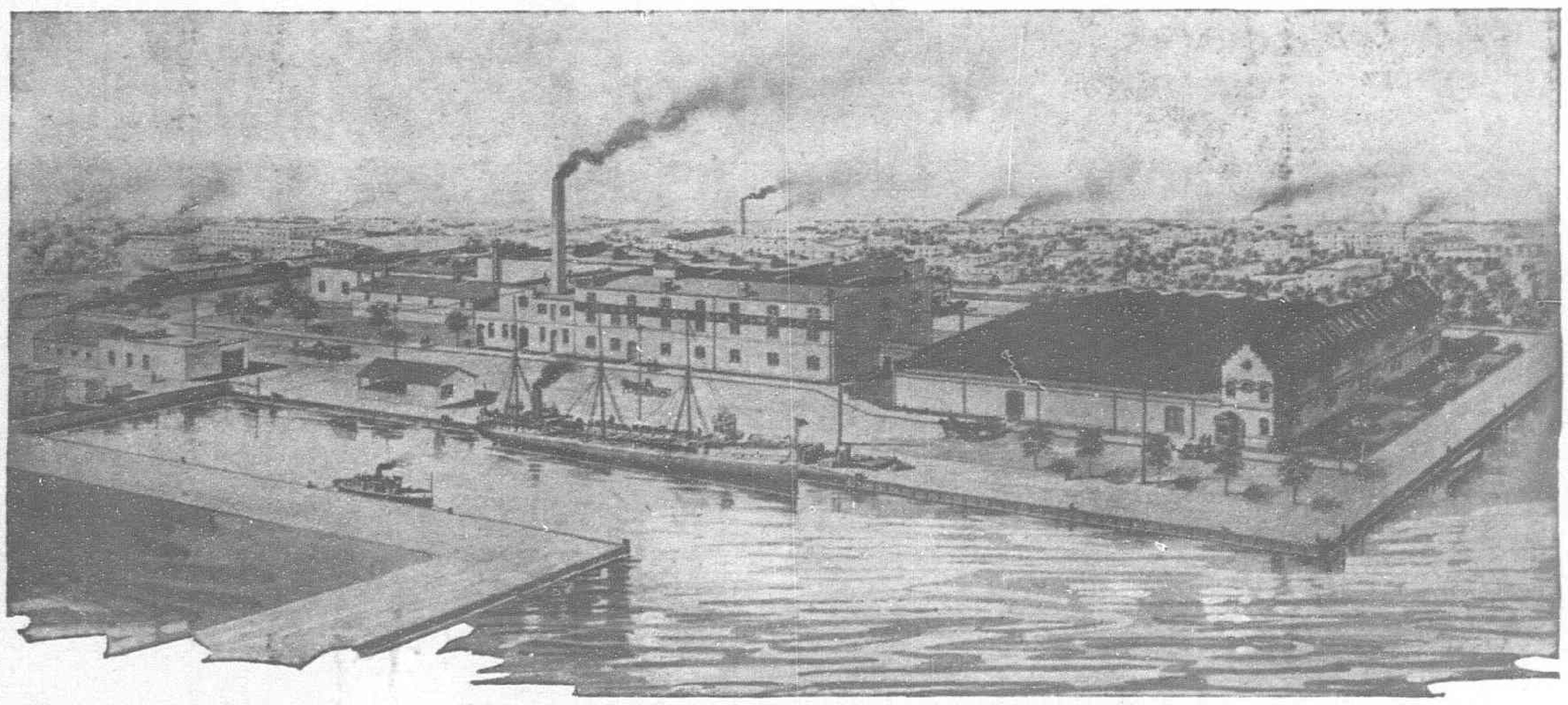

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

Vol. XXII SHANGHAI, AUGUST, 1926 No. 8

MANCHURIA

Mr. Hearst Is Wrong Again

Every once in a while, the Hearst press develops a bad case of anti-Japonism. Someone puts one over on them. Some one gives them a story which they run without verification and which they play up as an original scoop. Many of these original scoops are scoops only because no other newspaper will publish the stuff. No first class newspaper would risk its reputation on such drivel. To the Hearst press it seems to matter little whether there is any truth in the story. They publish it and get circulation by being original even if untruthful.

The most recent Hearst scare deals with Japanese developments in Manchuria and Korea, which they allege, have for their object the gathering of sufficient supplies of war materials, so that Japan can go to war with the United States of America. Could anything be more fatuous! It looks very much as though Mr. Hearst's informant had been having a conversation with the Soviet's Press representatives somewhere between Peking and Harbin and had swallowed a wopper.

There is no question in the Japanese mind of a war with the United States. The Japanese want to live at peace with the United States as they want to live at peace with all the world. There is no quarrel between Japan and the United States. There is no outstanding cause for a quarrel. There are little misunderstandings, as there are among all nations. But these misunderstandings are easily settled.

But Japan has an enemy, a very serious, a very dangerous enemy. That is Soviet Russia. Japan's national existence depends upon the raw materials of Manchuria and Mongolia. Soviet Russia, most blessed of all countries in raw materials, begrudges Japan her small share of the world's wealth. Soviet Russia would destroy Japan's position in Manchuria and Mongolia. On that question, Japan cannot compromise. On that question, there may one day be a war between Japan and Soviet Russia. Mr. Hearst's informant got his dope twisted: **It is not the United States that Japan hates and fears; it is Soviet Russia, the enemy of the United States in China, the enemy of democracy throughout the world that Japan may have to fight.**

IN this number of the Far Eastern Review appears two articles on Manchuria, one by Mr. Uyeda, private secretary to the President of the South Manchuria Railway, on the history of the development of the Three Eastern Provinces; the other article, deals with the new railways being built by the Chinese officials in Manchuria and Mongolia.

The importance of Manchuria in the affairs of China, is often under-estimated by both Chinese and foreigners, because everything outside the Great Wall is almost foreign soil. Yet, Manchuria presents the spectacle of the most extensive and keenest development in the whole of China, during a period of civil war and militarism. Manchuria's development in agriculture has been a revolution in economic ideas. Unlike China Proper, Manchuria is sparsely populated. The Chinese, who came there from Chihli and Shantung, had the pioneer spirit and therefore, were less subject to initiative-destroying traditions, so overwhelming in other parts of China. Largely through the agency of the South Manchuria Railway, every modern ideal and method has been brought to the Manchurian population with excellent results.

Hampering the development of Manchuria, is the fact that it is the high-road between Russia, China and Japan. To keep Manchuria open, Japan has fought two wars, in the course of which she defeated China and Russia and became the principal power of Asia. Japan's political fate has thus become inextricably associated with Manchuria. And from this position, there can be no receding.

Japan has developed Manchuria and Manchuria must in return provide Japan with the raw materials which are so essential to her as an industrial nation. Japan understands this position. But so does Soviet Russia.

The Russian policy now is to destroy Japan's economic position and lessen her international prestige, by attacking Japan's position in Manchuria. It is easier to make war on Japan in that way than to fight a war on Manchurian soil. The main Soviet weapon is propaganda—a fairly inexpensive weapon in China. In the large industrial centers of China, Japan is constantly being attacked by Communist Party representatives and many other wise intelligent Chinese, fall for this propaganda because they fail to understand the basic aim of Soviet Russia. In a city like Shanghai, one of the three most decent industrial organizations is the Naigai Wata Kaisha cotton mills, who employ 15,000 laborers and do more for them than any other employer does for labor. Yet the Naigai Wata Kaisha has more strikes than any other employers. The explanation lies in the fact that whenever anything occurs in one of their mills, as something must occur among 15,000 laborers, the Communist agent is ever present to stir up a strike. Some of these strikes do not last more than a few hours; yet they are troublesome and expensive to industry. To attack Japanese industries and trade in China, to weaken Japan's Commercial position is the definite policy of Soviet Russia—with a view always to Japan's position in Manchuria.

Soviet Russia believes that it can goad Japan on to a destructive war in China because the Chinese people will support Russia against Japan. In this Russia is mistaken. Let Russia take note of one fact: Feng Yu-hsiang is more capable than Wu Peifu and Chang Tso-lin; the Canton Government is the only genuine government in China. Yet, neither can achieve their ambitions. Feng helps the people of any district in which he may be; while Wu and Chang tax and pillage the people and bring upon them sufferings and hardships. Yet, Feng can never be popular. Wherein lies the explanation?

The Chinese people are Conservative and fear Soviet Russia and its social and economic doctrines. The Chinese protagonists of Communism have frightened the masses of the Chinese people by their ideas and actions. Soviet Russia, therefore, cannot overcome mass dread for an alliance between China and Russia. Such an alliance is a psychological impossibility.

Russia errs when she risks trouble in Japan in Manchuria. For in the event of a war, the United States, Great Britain and France will support Japan. Russia cannot fight the world.

The Unseen Hero of the General Strike

A Lesson for Japan

By George Bronson Rea

THE great strike in England has passed into history. The political atmosphere has cleared and although the coal dispute still goes on, the fear of revolution which has hung over the country for years has been dispelled. A new sense of security exists ushering in an era of better understanding between Capital and Labor in which it is hoped economic conditions can be restored to a higher level.

The great mass of the British people stood solidly behind their government in resisting the rash attempt to overturn their constitution and starve them into submission. How the victory was won is now common knowledge. From all over the country, from all walks of life, volunteers stepped forward into the vacated places and carried on. A new generation has forever shattered the basic delusion of trade unionism that only skilled mechanics can perform certain specialized jobs. Modern invention, labor-saving, labor-aiding, simplifying and fool-proof devices have made it possible for the average intelligent untrained man successfully to take over the operation of many machines heretofore zealously guarded as the exclusive right of so-called skilled labor organized into protective groups for monopolizing the jobs. The British people saved the nation but they could never have succeeded had it not been for modern inventive genius. The unseen hero of the Great Strike is THE ENGINEER, the collective brains of all countries whose inventions have contributed to the remarkable advance in modern engineering science.

Fifteen years a general strike might have stood some chance of success in Great Britain. The life of the nation is bound up in rapid transportation and when this vital service was performed exclusively by coal-using railways, it was a comparatively easy matter to blackmail capital and precipitate widespread disorganization by suspending their operation. The motor vehicle and thousands of miles of good roads reaching into every nook and corner of the country, has changed all this.

The public bus drivers who joined the ranks of trade unionism overlooked the essential fact that every intelligent modern boy and girl knows how to drive an automobile, and those that don't could soon learn how. Such drivers may not be skilled mechanics competent to make engine repairs, but neither is the average bus-driver. Numerous garages obviate the necessity of this part of a driver's education. When the people of England awoke on the morning of May 4 to a complete stoppage of their favorite transportation facilities and faced the prospect of walking miles to work or remaining at home, volunteer drivers appeared as by magic beseiging the motor bus companies for jobs. Every private automobile in the country driven by their owners, by youths of both sexes, was out on the highways and byways within a few hours picking up pedestrians and carrying them to and from their work in the city free of charge. The distribution of essential supplies formerly undertaken by the railways was taken over by motor trucks and the immediate food situation relieved.

It is not such a difficult task for the average engineer to learn how to run a locomotive and although preference was naturally given to those who had previous experience, the breaking in of new locomotive drivers was rapid. From the first day of the strike enough trains were run on the main railways to maintain the vital services and before it was ended most of the lines had resumed normal train operations. It was the same with the electrically operated lines. Most any intelligent mechanic can operate the starting and stopping handles and the brakes of an electrically driven railway car, so the stoppage on the underground services was hardly felt, owing to the rapidity with which the places of the strikers were filled.

The attempt to suppress the dissemination of news by calling out the printing trades was effective enough in one way, but a dismal failure in another. The radio came into action and broadcasted the news of the hour to thousands of eager listeners and provided an opportunity for hundreds of owners of typewriting and duplicating machines to issue frequent bulletins which were snapped up at a penny a piece by the waiting crowds in the streets. In this way the facts of the changing situation were placed before the public almost immediately, many hours before they could have been printed and distributed by the regular daily newspapers and news-services. For the rapid dissemination of vital news the radio and other mechanical inventions has definitely displaced the newspaper.

However, the newspapers were on the job, and although I am inclined to believe that their performance was excelled by the leading British newspaper of Shanghai when faced with a similar menace, some of them displayed extraordinary enterprise. *The Daily Mail* for instance, had the news telegraphed to its Paris branch where emergency editions were printed as fast as the news came in and distributed throughout England by æroplane. In fact, the official government newspaper, *The British Gazette*, which reached a circulation of over two million copies a day, was carried from London to central distributing points throughout the country by air and delivered to waiting motor cars for local distribution. Here again, emergency measures beat the normal machinery for disseminating the news.

The strike tied up the steamers loaded with food supplies and the strikers formed a picket line around the dock entrances to intimidate volunteer workers. It looked as though serious trouble might break out in this direction and the government took very effective measures to convince the strikers that no interference would be tolerated in distributing the necessities of life. A fleet of motor trucks protected by armed guards in full war equipment convoyed by tanks, filed through the streets of London to the docks and proceeded to unload the supplies. Before this show of authority the most bellicose agitator was transformed in the twinkling of an eye into a smiling pacifist. Several submarines crept up the Thames underwater, bobbing up alongside vessels whose winches were operated by electricity connected up their current with the ship's switch boards and to the amazement of the watching strikers, the work of unloading went merrily on.

Modern methods in other lines played their part in breaking the strike, but the main credit must go to the motor vehicle and the thousands of independent citizen drivers brought into existence by its wide-spread use. The lesson taught is that the general strike can never succeed in a small heavily motorized country enjoying a net work of good highways and where the distance between the sea ports and the population center is comparitively short. Motor services in England may not have reached that stage where the railway can be dispensed with as a carrier, but in a pinch they can very adequately guarantee to the nation that it will never be brought face to face with starvation through a failure of the railways to distribute its daily food supply.

The same lesson applies with equal force to other small countries similarly situated, (like France, Germany, Italy, and perhaps Spain and Portugal) as long as their roads are maintained in good condition. Japan is perhaps the one important country whose physical conditions approximate those of Great Britain, where a general strike might precipitate disaster through failure to distribute food supplies arising from the lack of sufficient motor vehicles and the absence of good roads. Given the will and the spirit of the people to combat such an attack on their very existence, the people of Japan would be hard put to fight such an enemy with any chance of success because of their backwardness in road building and the short-sighted government policy of penalizing motor car owners. The moral to Japan of the general strike in England is to prepare against the day when a similar attempt may be made against the life of the Japanese people, by pushing forward the program for new road construction and encouraging the use of motor vehicles until the average man-in-the-street is familiar with their operation.

Reply to Certain Allegations Concerning Labor Conditions In Japan

By Tamon Mayeda, Chief of the Japanese Delegation to the International Labour Office

RECENTLY allegations have been repeatedly made by the Indian millowners in English newspapers and elsewhere that the Indian cotton mill industry is suffering largely from unfair Japanese competition due to the non-ratification of the Hours Convention by the Japanese Government. In view of the gravity of the question, I take it as my duty to set forth a brief explanation of the situation with a view to eliminating all possible misunderstanding which might have been created through the one-sided presentation of the case from the Indian millowners.

I am always quite willing to listen with profound respect to any criticism raised against the slow progress in the ratification of the Hours Convention among the chief industrial nations. There is no reason to object the argument made from a general point of view that a country which has not yet ratified a certain convention should be encouraged to do its best for its ratification. I cannot, however, accept a contention that Japan should ratify the Hours Convention at once because her non-ratification gives her an advantage over India in the unfair competition in the cotton spinning industry. I cannot accept this argument because, in practice, in spite of the delayed ratification of the Convention by Japan, there exist no difference between the working hours in Japan in this particular domain of industry, namely cotton spinning, and those imposed on India by the Convention—ten hours a day. Through the regulation of the Cotton Mill Federation of Japan, all of its members, comprising most of the cotton mills of the country, have adopted ten hours as a maximum day's work for their employees and a complete stoppage of operation at least four days and nights per month. If the question of the working hours in Japan is to be considered in general, it may be said that one cannot help being struck by the rapid progress made in their shortening. For instance, the number of factories adopting 8 hours or less was 12 per cent. of the total in 1919, but it increased to 21 per cent. in 1921.

In passing, attention should be drawn to the fact that the working hours imposed on Japan by the Washington Convention are shorter than 10 hours a day which are allocated to India. In other working conditions too, those required of Japan by the Convention are more rigid than those asked of India. It is quite misleading then to declare that Japan has not ratified the Convention which India has ratified, as if ratification meant the same thing in both cases. In a work there is no actual connection in the present question between the ratification of the Convention and the so-called Indo-Japanese competition in the cotton trade.

If, furthermore, the other working conditions actually prevalent are taken into consideration, it may with confidence be stated that the Japanese labour conditions are second to none in the East. Take wages as an instance: comparing on the same basis and in the same months of the year, the wages of Japanese spinning operatives are at least 60 per cent. higher than those paid to Indian operatives, as recorded in the official Enquiry of the Labour Office of the Government of Bombay. And if the wages of the female operatives only are considered, the Japanese wages are more than double the Indian wages. Generally speaking, the wages in Japan have more than trebled while the price of daily needs has doubled during the last ten years. In this connection, reference may be made to the study on "Wage Changes in Various Countries" published by the International Labour Office in 1926. In this document, it is clearly shown that the wages paid in numerous branches of industry in Japan have already been fairly brought in line with those paid in the corresponding branches of industries in the chief western industrial countries. In the light of this authentic and impartial study, should the labour conditions in Japan still be designated as "sweated labour" in comparison with the labour conditions of India?

With regard to night work which constitutes the object of complaint on the part of the Indian millowners, the Amended Factory Act provides for its abolition, and so it will be done away with on its enforcement in accordance with the provisions of this act. The Imperial Ordinance for the enforcement of the Act was already decided by the Cabinet and has been presented to the Privy Council for consideration. The Government expects that every step for immediate enforcement of this Act will be completed within this year.

Up to the present, Japan is the only country in the East which has ratified the Conventions for the Minimum Age for Seamen and for the Agricultural Workers, and which has decided to ratify the Convention concerning the Minimum Age for Industrial Workers. Can a country which has courageously adopted these humanitarian measures together with all other ameliorations of the working conditions already mentioned, be stigmatized as a country of "sweated labour"? The Japanese Government has recently extended the suffrage to all male adults so that the working class might have a voice to a greater extent in public affairs. The Government has, moreover, presented to the Diet the Trade Union Bill, the Labour Dispute Arbitration Bill and the Bill deleting Articles 17 and 30 of the Public Peace Police Act, with a view to carrying out its liberal policy in labour problems. The two latter bills were passed by the Diet towards the end of March of this year. The Government is now busily engaged in general preparation for the execution of the Health Insurance Act, already passed by the Diet, with the hope to bring it into force from the beginning of next year.

All these evidences clearly show that the Government is not neglecting its duty of promoting the interests and safeguarding the welfare of the workers. On the contrary, it can fairly be stated that the most energetic efforts are being made by the Government to improve the labour conditions as much as circumstances permit it. These efforts shall be appreciated all the more if one considers the tremendous difficulties Japan is encountering in her population problem, in the restoration work of her capital and its vicinity ruined by the great catastrophy of 1923, and because of its close neighbourhood of number of countries in which labour is exceedingly cheap and in which no international obligationss exist regarding labour conditions. Moreover, her peculiar position as a newcomer among the group of great industrial nations which had long ago established their economic prestige, must also be taken into consideration. In spite of all these difficulties, Japan is sincerely endeavouring to attain the goal set by the International Labour Organisation. Only it must be remembered that to do all by one stroke is not humanly possible.

* * *

Crusaders in the Far East

By Stella Benson in "The Empire Review"

THE world of competition in China is, for Europeans, full of bugbears. Englishmen, Frenchmen, and Japanese in China will, in future ages, be born with eyes all round their heads—we are all too busy looking over their shoulders to see if anyone is coming up behind them to take advantage of them. And, of course, our distrust is justified. Our bugbears are real—they actually bite. Yet I think we all tremble a little oftener than we need; we all have at least one bugbear too many. The French, for instance, are afraid of American missionaries. A large number of Frenchmen in China and Indo-China believe that the Y.M.C.A. is an insidious secret society organized for the undermining of

French influence and the unearthing of French private motives. To the Frenchman, the pink, earnest young man from Oklahoma, who arranges Get-Together Leagues and Evenings of Clean Fun for reluctant Chinese clerks, is a snake in the grass. The French eye sees a horrid hidden purpose in *The Saturday Evening Post* in the "Y" reading room; the French ear hears an ominous note in "The End of a Perfect Day" played by a victrola to a row of young Chinese go-getters perspiring in a cordial attempt to enter into the spirit of the fun. The French call these phenomena "spreading American culture," and believe that they are inspired by secret orders from Washington.

And *spread* the culture certainly is. Certainly, Ella Wheeler Wilcox is better known among enterprising Chinese students than John Keats; certainly, in "Y" circles *American business* is synonymous with *civilization*; certainly, the American movie is colouring the young Chinese dramatic vision; certainly, the voice of Occidental music speaks to China through the voice of an American machine, or, at best, a saxophone. But that all this is part of a deliberate and fiendish plan, evolved by President Coolidge and William Jennings Bryan in dark, secret conclave in Washington and published in cypher among the missionaries of the Far East, I never shall believe.

The truth is that the American spreads his culture by mistake. He is so good that his goodness overflows and splashes all the rest of us. America has tons and tons of salvation to spare and China is the world's best dumping-place for salvation. The continent of North America is so stuffed with altruism that it has exploded and fragments fall on China in the form of missions and Y.M.C.A.s. There is a certain type of young man from the Middle-West who may be said to be a spark from the explosion of altruism, and, wherever he falls, he starts a little fire. To imagine an ulterior motive behind the beaming pince-nez of this type of young man would be impossible to any but a French functionnaire.

Good intentions are America's principal export. It is a kind of spiritual imperialism. Hands across the sea are stretched out to drag China into the fold by the scruff of the neck. America is the land of crusaders.

The motive of a crusade has to be simplified to the last degree. You never could inspire a crusade in support of Proportional Representation, or Single Tax, or Universal Decimal Coinage, or anything that could not be explained in a single head-line above a photograph labelled "Prominent Fellow-Citizen Boosts Million-Dollar Drive for Cause." All problems are simplified almost out of reason by the excessive goodness of the American people and by their system of compressing their goodness into the tabloid form known as the slogan. The Opium Question, for instance, has become so simple in America that its own mother would not know it. Opium is *not* grown in China—at least the American eye of faith does not see it, though to common people like you or me opium would seem to be almost the only crop visible in the remoter provinces of China. But crusaders know better—opium is *not* grown, it is simply imported by those fiendish British who, for their own advantage, force the poor innocent Chinese to become slaves to the drug. There is no Opium Question. Right is right and wrong is wrong. The slogan "Save China's Soul" is enough to cover any question. And it would be merely rude to inquire if America really recognizes the existence of the soul she is about to save.

For she *will* save it. Sooner or later, China will be smothered in salvation. You can save anything if your problem is not complicated by understanding. There is a faint perfume of American salvation in all the air of China already.

"Blessed are the good for they shall inherit the earth."

* * *

Coal and Oil

The Fight for Supremacy

FOLLOWING closely after the article appearing in the July number of THE FAR EASTERN REVIEW on "Disarmament, Diesel Engines and Oil," comes the announcement that British engineering skill has succeeded in perfecting a steam turbine using pulverized coal as fuel under the boilers whose efficiency approximates very closely the best performance of the Diesel engine. This result is hailed by the British press as a triumph which will save the coal industry from ruin, preserve the supremacy of the British mercantile marine and effect a considerable reduction in operating costs.

The successful advance of the British turbine engine in competition with the Diesel is in three directions. First, the Diesel engine has been able to extract some 18,000 British thermal units from oil, while the turbine has been able to obtain only about 14,000 units. The improved British engine will obtain practically the same thermal efficiency as the Diesel.

Secondly, the new turbine's improved efficiency, due to the latest high temperature and high pressure facilities, enables it to approximate the Diesel standard while using coal, which obviously is and must continue to be cheaper than oil, particularly if the coal is used in pulverised form. Lastly, the turbine will not be as expensive to install as the Diesel.

As an immediate result of the experiments one of the largest British shipping companies has decided to place orders at once for several ships whose engines are to be constructed on the new principle.

Because it was realised that the development of oil-fired engines menaced England's coal wealth, leading technical minds applied themselves to winning anew for the British mining industry the value which had been so substantially written down by the appearance and perfection of the oil-engine.

The first definite step was taken twenty years ago. Sir Charles Parsons, the famous British engineer, patented a design for a British turbine engine. But the metallurgists had to play their part, by producing material which would bear the high temperature and resist the high pressure upon which Sir Charles Parsons had calculated.

Sir Charles designed and laid down a small steamer which was to embody all the developments perfected on the turbine during the past score of years. Independent experts have scrutinised his plans and figures to the smallest detail.

The new turbine will give, it is authoritatively stated, practically the same efficiency as the Diesel engine. Its importance lies in the fact that the fuel used may be either oil or coal. The ideal fuel, it is anticipated, will prove to be pulverised coal. Probably the new ships to be built forthwith will use oil for the time being, since the liquid fuel is cleaner and easier to handle.

Meanwhile research is proceeding on the problem of producing a safe and efficient pulverised feul. Tests made last week, it is claimed, show that the problem has been solved. The lowest grade of coal, selling to-day at the pit-head at from 6s. to 8s. per ton, was treated in a retort until the oil, gas, and ammonia were eliminated. The resultant fuel was pulverised into fractions, each about a two-thousandth part of an inch.

The flash point of the fuel, when stored in bunkers or in bulk, is so high that there is no danger of premature explosion. Experiments on British destroyers have shown that the pulverised coal can be fed as easily as oil.

The results obtained have been carried out in actual practice on the new turbine steamer *King George IV.*, and from what has been accomplished to date it is entirely probable that the new inventions herald a return to coal-burning steamers, a boon not only to Britain but to the entire civilized world dependent at present upon a decreasing supply of oil to operate rapidly increasing use of motor vehicles and other indispensible industrial power plants.

Just when the British are congratulating themselves on having discovered a new basis on which to prolong their industrial supremacy, along comes the German chemist and announces that he has discovered a new synthetic motor spirit that will free the world from its dependence upon petrol. A group of German scientists in the employ of the Dye Trust have perfected a system of extracting oil from coal and hopes within two years time to place 300,000 tons of synthetic motor spirit to be known as "motorlin," on the German market. The Reich alcohol monopoly is also prepared to place on the market a mixture of alcohol and benzole as motor spirit. The rivalry between British and German brains and initiative is a keen one that will keep both nations keyed up to a high pitch of efficiency.

Manchuria in Twenty Years

A Retrospect of Development of Culture in Manchuria with Political and Economic Changes

By Dr. K. Uyeda, Private Secretary to S.M.R. Co.'s President, Dairen, Manchuria

(Dr. K. Uyeda, private secretary to His Excellency the President of the South Manchuria Railway, and one of the great authorities on Manchuria, recently prepared the following article for the monthly supplement of the "Manchuria Daily News," which we reprint for its historical value.)

THE name of Manchuria is now known all the world over. Before the Russo-Japanese War, Manchuria remained a sealed book and in oblivion, except to a circle of specialists. The Chinese themselves became acquainted with the name only a few hundred years back. Ten years before the Russo-Japanese War, in which the Sino-Japanese War broke out, this name became known to the enlightened classes of Japan. Still the name of Liaotung Peninsula was in more popular use. The name "Liaotung" has been handed down in Japan from the time of the invasion of Korea by the great strategist, Hideyoshi (Toyotomi).

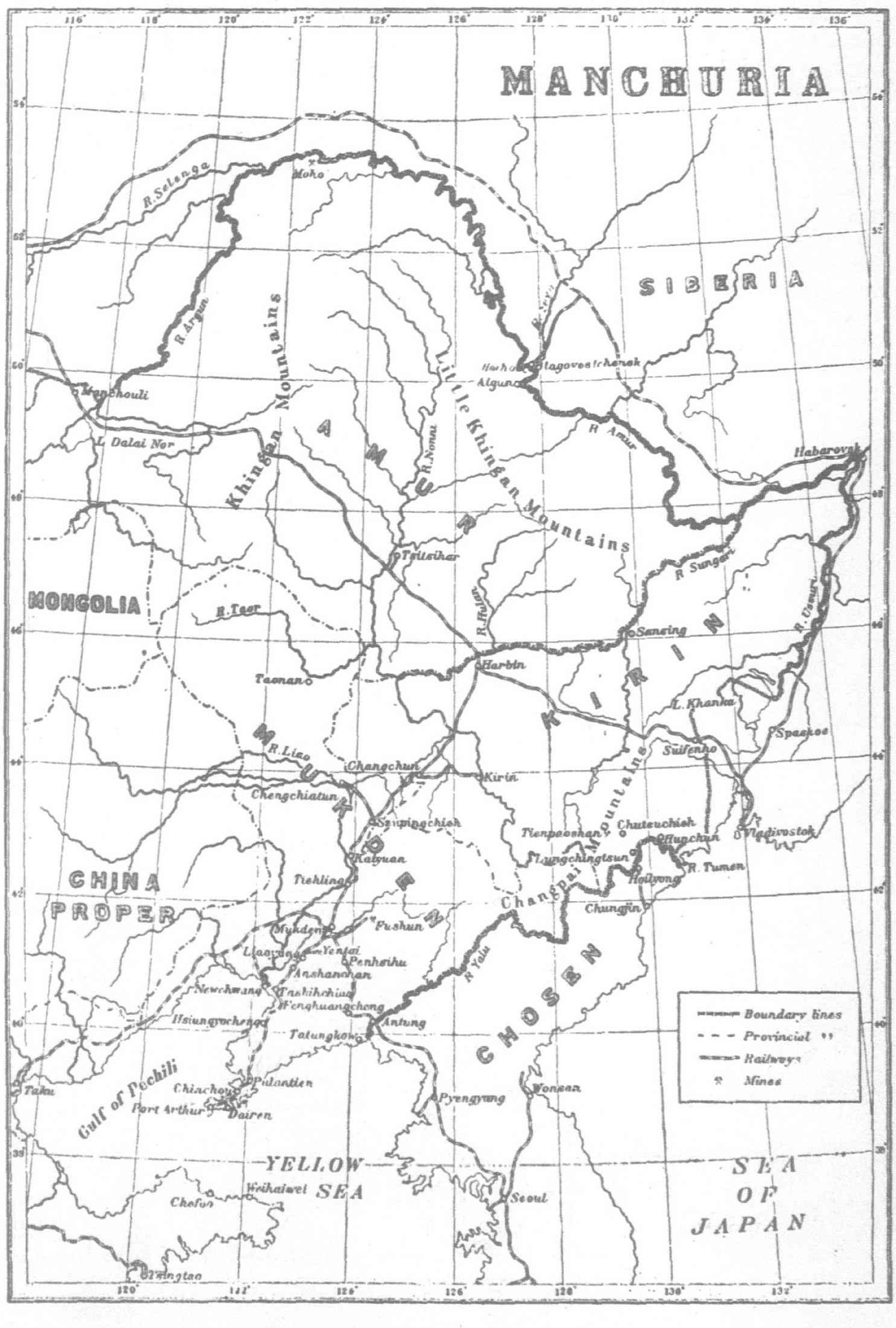
During the Tokugawa Shogunate, that succeeded to Hideyoshi's Regency, the Japanese used to refer to North and South Manchuria at present as Tartar.

In the old history of China, till Emperor Shihhuang of the Chin Dynasty conquered all China, Manchuria was called Sushen.

At any rate, nothing about the country now included in Manchuria was known by the outside world. There existed then a ferocious and warlike tribe that the rulers of China proper deemed necessary to fend off by erecting the Great Wall, one of the Seven Wonders of the World, the most stupendous masonry work ever put up by man, in a zone from North China eastward to Manchuria. Still the Hans (of China proper) seemed to imagine that Manchuria was inhabited by the Fuyu and Sushen tribes.

It is possible that 3,000 years ago, the Sushens dominated the northeast of Manchuria, while in the southwest and probably extending to Korea, the Fuyus were its masters.

Again, these races are believed to have been preceded by a courageous and progressive race that crossed the sea southward from Korea to settle down in a land of promise.



However, in the time of the Han Dynasty, the Fuyus had already disappeared from Manchuria, while the Sushens had been driven in the direction of Siberian Littorals leaving all Manchuria to the domination of the Kaokulis.

In Liaotung Peninsula on the Gulf of Pechili, places for settling Hans (natives of China proper) could be found everywhere. Allowances might be made about the topographical changes that have been worked out by time since. Such changes might have been more noticeable about the mouths of rivers. About Pingyang (Chosen), to which a Governor was sent from China in the Han Dynasty, might have had the sea getting as far inland as near Pingyang in a sort of creek that might have narrowed down into the Daido river.

When Emperor Yang of the Sui Dynasty attacked Manchuria with 300,000 troops, Haicheng was the only port worth the name on the Gulf of Pechili. This Haicheng is now located in the centre of South Manchuria.

Again in the Hsienfeng Era of the Ching (Manchu) Dynasty when Peking was occupied by the allied forces of Great Britain and France, the port of Newchwang was opened for the first time by virtue of the Tientsin Treaty. When half a century ago the British Consul appointed to Newchwang visited Manchuria to open the new Consulate, he found Newchwang 17 miles inland from the mouth of the Liao not accessible to even a steam-boat. With creditable tact, the Consul landed at a small fishing village on the left bank of the Liao, calling it Newchwang and settled down there. It is the present Newchwang or Yingkou. Kwantung Government authorities call the place Yingkou and exercise the police authority over there. Only the Foreign Office, Tokyo, will style it Newchwang after the foreign fashion.

From olden times, Manchuria has been associated closely with Japan.

As early as Empress Jingu's invasion of Korea (306 B.C.) a small flotilla of Japanese Expedition craft is claimed by some historians to have attacked the southern extremity of Liaotung Peninsula by way of diverting the enemy's attention. For about 300 years after the reign of Emperor Tenji, messengers from Pohai used to visit Japan to present the tributes at the interval of a few years, taking back with them gifts in the shape of silks, etc. Looking up Japan's history, Pohai is put down as a sort of vassalage, but in fact, such was in all likelihood a mere instance of a vainglorious bragging by the insular race. The people of Pohai might have had quite another view of the matter.

At any rate, fact proves the existence of a happy relation between Japan and Pohai, for, in Japan's intercourse of amenity, trade, etc., with China, Pohai seems to have served as the medium. Again, in despatching an envoy to China, then under the Tang Dynasty, he travelled along the western coasts of Korea northward to the mouth of the Yalu, and, then turning westward, got to the promontory near Port Arthur, wherefrom he crossed the Gulf over to Tengchow, Shantung, bound for Changan (now Hsian), then the Capital of China.

Why such a round-about route was taken was because a passage through the domain of Pohai brought up no possibility of an international complication to arise. Next, the above-mentioned route to Changan (Hsian) being what was followed by the emissaries from Pohai to the Changan Court, it is possible that Japan's envoys to the Tang Court were conducted both ways by Pohai people.

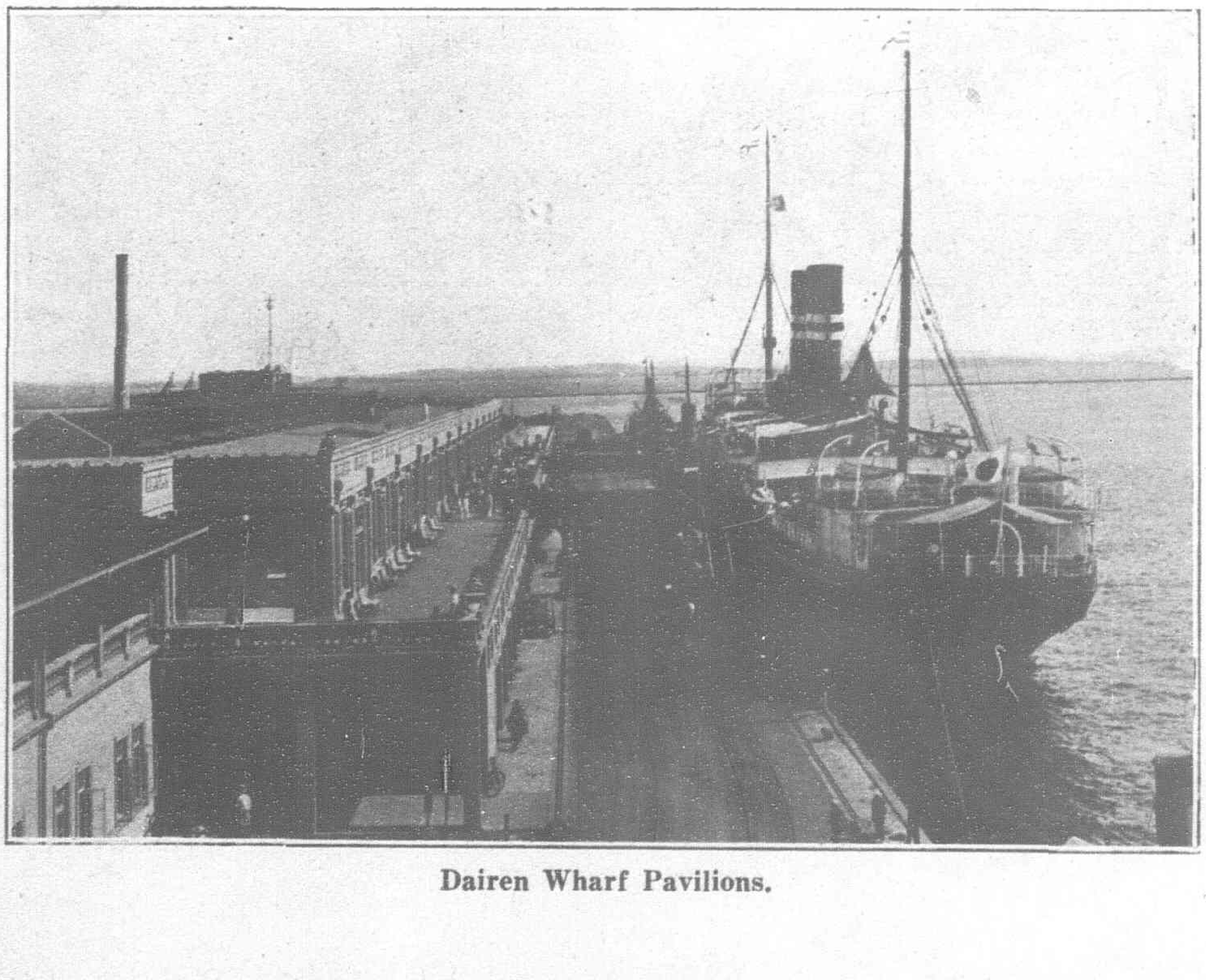
At all events, the name "Ryojun" (Lushun in Chinese), signifying "on Travelling High Way" was probably derived from its being on the route to the national capital. Some people have only a slight opinion of Pohai, taking it for a small, weak tribe occupying only a portion of Manchuria about Ninguta in Kirin Province. However, the history of China proves that Pohai ruled over South and North Manchuria in the place of the Kaokulis. Probably the Pohais were kindred to the Kaokulis originating about Ninguta. However, Pohai that communicated with Japan then, was established at the base of Maoerhshan (a mountain) on the left bank of the upper Yalu and the seat of its government was known as Hsikingfu (Western City). What was Tungkingfu (Eastern City) refers to Nikolisk on the Ussuri Line and Nanking (Southern City) was no other than Chutzukai, Chientao. Ninguta that was called Peikingfu (Northern City) was bounded by the Sungari on the north, and governed North Korea and the whole of Manchuria, including the valley of the Daido river (Chosen), the Yalu, and the Tumen.

The country apparently enjoyed a suitable level of culture. Among the stipulated tributes offered to the Tang Court from Pohai were included "liuli" tiles of purple blue color (the same as glass tiles) that were then claimed to be the finest to be had.

Pohai disappeared on being vanquished by Liao. Liao was crushed by Chin, which, in its turn, was brought down to bite the dust by the Yuan Dynasty, only to be conquered by the Ming Dynasty which kept Manchuria about 300 years. The natives of Manchuria were then Muchen tribe.

The Japanese had then direct intercourse with Manchuria through their predatory visits, that are referred to as *hokou* meaning "Japanese invasion."

Young Japanese fishermen and others, taking advantage of the imbecility of the latter days of the Ming Dynasty, crossed the sea over to Liaotung Peninsula coasts. They made the Elliot Group (the group of small islands dotting the eastern coasts of Leased Territory) the base of their operations, raiding the sea-coasts from Kaiping on the north eastward to the western coasts of North Korea, delivering frequent attacks even on Shantung coasts. The ruins of many fire-rocket stations (for signalling) and forts still traceable along the Liaotung coasts remain the memories of defences against Japanese raids.


Dairen Wharf Pavilions.

While, in the latter days of Ming, China proper was being hacked by civil wars and foreign invasions, and while the territory outside the Great Wall was left in neglect, the Aichinchuehlos, the family that opened the Manchu Dynasty, became master of all Nuchen tribes in South and North Manchuria, and seized Liaoyang, driving the Lord of the Ming Dynasty beyond Shanhaiwan. He settled down at Mukden and founded the Manchu Dynasty.

There are conflicting opinions as to the origin of the name of Manchu, but it seems certain that this name originated at that time. Subsequently, the Manchu general led 200,000 bannermen beyond the Great Wall into the centre of China, sweeping everything before him throughout the length and breadth of the vast country. He ascended the throne of China at the Peking Palaces as the founder of the Ching Dynasty.

Manchuria, after its master shifted his base to Peking, was declared as the sacred cradle of the reigning Dynasty, closed to the immigration of the Hans, the natives of China, and reserved exclusively for the sake of the bannerman and their descendants.

History repeats itself. The peace of the Manchu Dynasty for two centuries began to be disturbed in the north. In the fifth year of Emperor Yungcheng, China signed the Kiakta Treaty with Russia. It marked the beginning of the steady advance of the Russian Bear eastward. From Turkestan the ravenous Bear made for Siberia. In the seventh year of Emperor Chienfeng, China concluded the Aigun Treaty with Muravioff, Envoy of Nicholas I, thereby signing away the vast territory north of the Amur, together with the base of the Suchen tribe, that is, the Siberian Littorals. About the same time, Annam in the south rebelled against the Peking Court and became independent. The Opium War ensued and Peking fell into the Franco-British Allied Armies, the Manchu Court taking to flight to Jehol.

One of the results of the great shock to China was the introduction of Manchuria into the world's notice. About the time of the Opium War, Great Britain seems to have been casting a longing eye on the western coasts of Korea and Liaotung Peninsula. Admiral Drake, in command of the British Far Eastern Squadron, caused the hydrographic surveys to be completed north of Saishuto (a large island in the south of Korea), extending the operations to the coasts of Liaotung Peninsula. The Changshan Islands were christened the Elliot Group. The Dairen Bay was named Victoria Bay after the reigning Sovereign. The name of Port Arthur was given by the same Admiral in dedication to Prince Arthur, Consort to the Queen. Moreover, surveys appear to have been carried into the land. Tahoshangshan (the highest mountain in the Leased Territory rising across the Bay to the north of Dairen) was named Mt. Samson, and the Bay at Pulantien Port Adams.

During the Sino-Japanese War (1894-1895), Great Britain might be minded to be friendly to China, but Russia stole a march on her.

In the same War, the van of the First Japanese Army got its first footing at Chuliencheng above Antung on the Yalu, fighting its way as far north as Haicheng and Old Newchwang.

The Second Army landed at Liushutun on the other side of the Dairen Bay and took Chinchou, swooping down upon Port Arthur. The whole of Liaotung Peninsula was ceded by Treaty to Japan, but was appropriated by Russia.

While the Japanese left none of their footprints in South Manchuria after the Sino-Japanese War, Russia carried out any changes she might fancy in Manchuria, that had seemed the sacred preserve of the Manchu Court.

In consideration of the recovery of Liaotung Peninsula from Japan and what help was rendered to raise the indemnity money payable to Japan, Russia leased what is known as Kwantung Leased Territory, started to construct a naval port at Port Arthur, and built a railway from Harbin south to Port Arthur, traversing the breadth of Manchuria. On Finance Minister Count de Witte's recommendation, the construction of the harbor of Dairen was taken in hand, and this new port was connected with the Trans-Manchuria Line by means of a short branch line starting at Nankuanling (a small station next Choushuitzu, the present junction).

The Trans-Manchuria Line (between Harbin and Port Arthur) was a purely strategic line, intending passengers being required to secure permission for a passage beforehand. Not only the operation of the trains, but also the station staffs were military officers and men. Russia might have regarded North and South Manchuria as part of her own territory. A Commissary was stationed at each of Tsitsihar, Kirin, and Mukden, the Provincial capitals, and the Russian Consuls were made to take orders from them. These Commissaries were the virtual heads of local administration and the Viceroy of the Three Eastern Provinces at Mukden was little more than a glittering figure-head.

Even at Newchwang thrown open to international trade by Treaty, Russia opened a Civil Administration Office, which controlled also Kaiping and Haicheng.

However, not the slightest indication of the modern town-planning could be seen anywhere along the railway, although there might have been some such plan in the Russian mind Kungchuling, Mukden, and Liaoyang, each had a tract of land of about 2,000,000 tsubo, but the only things completed therein were the barracks and the residences for the railway people standing in the midst of a wild plain. Since Russia was the virtual ruler of Manchuria through her Commissaries, she perhaps gave no thought to the construction of modern towns along the railways.

What the Russians installed during their occupation of Manchuria were the construction of the city of Harbin in the north, the naval port of Port Arthur, the fortress for the command of the Gulf of Pechili, and the commercial harbor of Dairen, in the south.

U. S. Consul Miller at Harbin, in one of his reports to the Washington Government before the Russo-Japanese War, referred to the new city of Harbin as the record of the wonderful enterprise worth special mentioning in the history of modern town-building in the Nineteenth Century.

Harbin is certainly a piece of wonderful work by the Russian authorities concerned that was only possible under the despotic Romanoffs, it being the creation of a magnificent city surpassing any town in Russia, with the exceptions of the New and Old Capitals, on a tract of low, damp area on the bank of the Sungari strewn with thatched huts of Chinese fishermen.

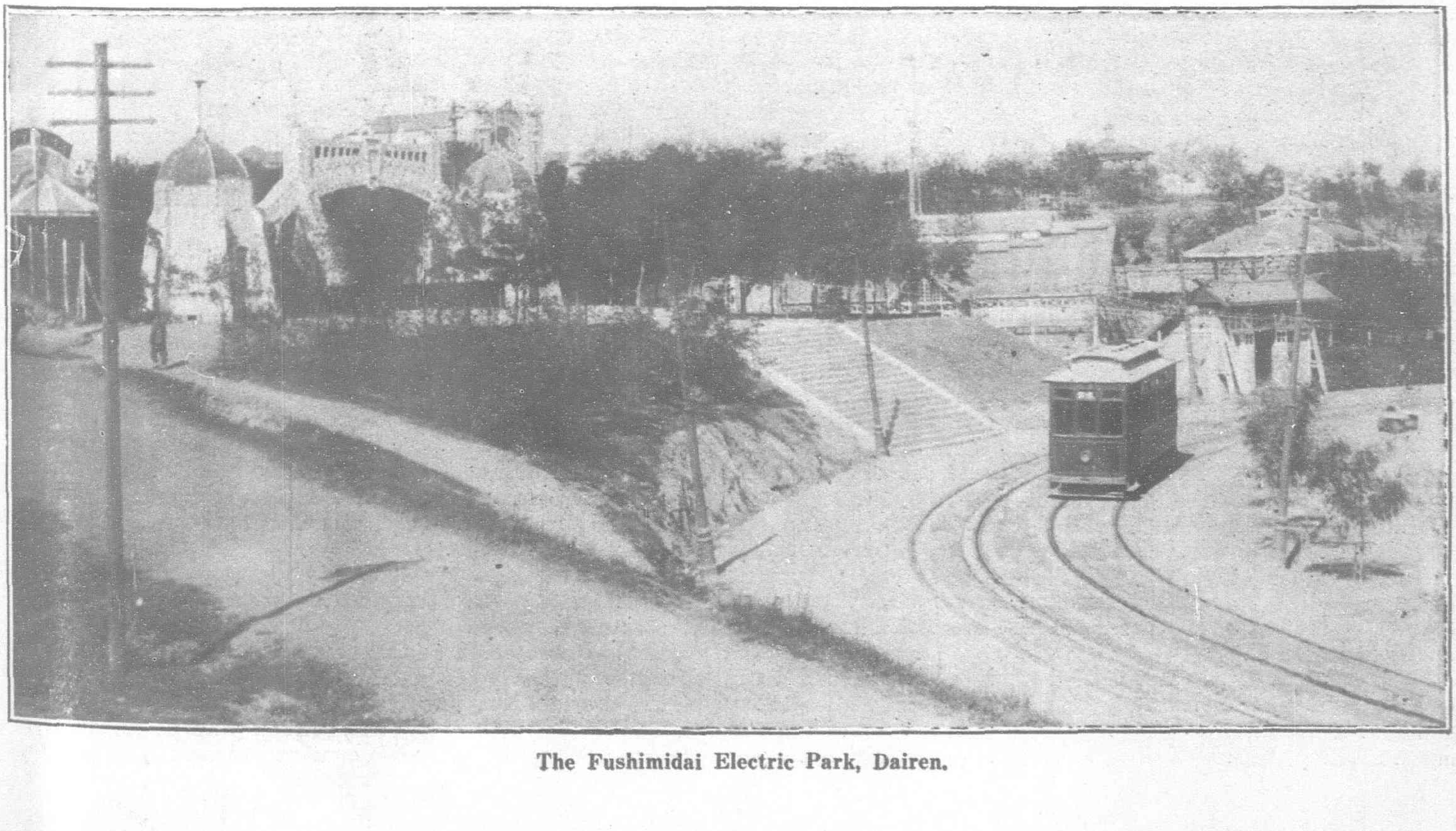
Turning to Dairen, even Admiral Drake commanding the British Squadron who made surveys of the Dairen Bay thought Liushutun across the Bay the only site available for harbor construction. Subsequently Li Hung-chang (the great general and statesman) caused Hannecken, a German engineer, to construct a naval depot in the Bay. The German engineer chose also Liushutun and proceeded to build the pier that still exists, and it stood the Japanese Army in good stead in the Russo-Japanese War at the time of its landing.

Such being the case, the news of the Russians starting to construct an extensive harbor and also a city at Dalny (now Dairen) in 1902 was received in Japan as hardly credible. For, many officers of the Japanese Army and Navy that had taken part in the Sino-Japanese War 8 years before were familiar with the topography of the Dairen Bay, knew well how unsuited Liushutun was as the site for a city and port of any importance and promise. No one ever dreamed of there being any such place as Dalny.

Of course, many Japanese remembered the seashores of Dalny, opposite Liushutun, having deep water with room to admit great leviathans of ships, but the recollection of the hill ranges, from 100 to 200 metres high, right along the shores put any idea of founding a city there out of question. They further remembered how Dalny faced the north, exposed to the biting north wind in winter, unfitting it to be a port.

Even on the declaration of War against Russia, followed with the talk of shifting the General Head-quarters of the Japanese Army to Manchuria, the General Staff Office, Tokyo, had only an imperfect notion of what Dalny was.

The author of the present article, who happened to be in the service of the General Staff Office under Major-Gen. Fukushima (later promoted to the rank of General) was put on a line of intelligence work with Commercial Commissioner Kawakami (late Director of the S.M.R. Co., and Minister to Warsaw), who had



The Fushimidai Electric Park, Dairen.

served at Vladivostok before the War, and Domofvsky (a refugee from Poland), who, after the Great War, held an exalted position in the Polish Government. The author was ordered by his chief to report on Dalny. A copy of the Directory issued in 1902, published at Shanghai, was procured, and the account of Dalny, together with the map thereof and the harbor improvement plan contained in the Directory, were submitted, and thus the exact position of Dalny could be located. The same map was blue-printed and distributed to the high officers of the Japanese Armies at the front.

Tracing how the nucleus of the magic city of Dalny was built, the Russian engineers reclaimed the shore front with rocks and earth quarried from the top of the hill range rising behind Dalny. Then, the ravines and fissures were filled up so as to plan a European city admitting a population of 40,000. They intended to bring up a China town on the level land running southwest of Fushimidai.

The great construction work of Dalny city and harbor was executed in competition with Viceroy Alexieff's enterprise to build up a modern town at Port Arthur. Finance Minister Count de Witte undertook the grand construction work of Dalny. 40,000 to 50,000 coolies were employed daily. The upper portion of the rocky hills that ran from Nogi-machi to all over Russian-machi, was blasted off, and the rocks were used to reclaim Hama-cho shores. What is now known as Naval Jetty and the Breakwater were the first to be constructed, and from this Jetty, the *s.s. Mongolia* and the *s.s. Manchuria* were made to ply to and from Nagasaki and Shanghai in connection with the direct Trans-Siberian trains. A major wet dock with a minor one, were also constructed near the Jetty and the Harbor Office and the power house were erected. This was in 1901.

In the Administration Quarter, north of Nippon Bridge, the Office of the Chinese Eastern Railway and residences for railway staff besides a hospital, a club, a park, etc. were built. At the same time, levelling work was prosecuted all over the site for the city to hurry up with the construction of the Wharves. In the midst of all this building activity, war broke out with Japan, and the nucleus city of Dalny was doomed to be seized by the Japanese.

The Japanese, on their occupation of Dalny, found everything a piece of rough and ready work. Especially the harbor improvement work, including the wharves, was found little better than pieces of humbag work. However, in the grandeur of plan, Dalny, with all its details of planning, might be placed at the forefront of its likes in the Orient. To the Japanese eye accustomed to dainty landscape gardening, the extensive scales of the Russian plan evoked admiration.

In our opinion, unless the Russians had left to the Japanese the example of town-planning, the City of Dairen (the old City of Dalny) might have grown up like Fusan and Chemulpo, each having a strong Japanese color. Nor would any modern town like Mukden and Changchun have made their appearance in all likelihood.

As the Japanese Army and Navy took the strategic positions of Nanshan near Chinchou by storm in the latter part of May, 1904, the Russians, in Government service and otherwise, absorbed in the construction of Dalny, were obliged to flee by land and by sea to Port Arthur. During the two days intervening before the occupation of Dalny by the van of Gen. Nogi's Army, the Chinese who happened to be at Dalny took to a general wanton looting taking advantage of the policeless and soldierless state of the town. Vandalism raged in full blast. Fire was set here and there. The more valuable loots were partly shipped to Chefoo by boat, or buried in the ground in the suburbs. To cite an instance, when Dalny, rechristened Dairen, had a Military Administration Office opened, starting to exercise police authority, 100 to 200 droskies, formerly owned by Russians were unearthed at Shakako (the seat of the Railway Workshops) and about Choushuitzu, the station next Dairen.

In July, when the General Headquarters of the Manchurian Army made its entry into Dairen, pillage had not yet been entirely stopped.

Mine-sweeping process having been far from finished in the Bay, a large number of mechanical mines were still left at their submarine moorings.

The *s.s. Aki Maru,* that carried Marshal Oyama, with Gen. Kodama (General Chief of Staff), etc., was advised to be guided by a man-of-war after entering the Bay to Liushutun on the other side of the Bay, then to Dairen, steering very carefully along the safe channel. Thus, about six hours had to be put in for the steamer to get to the Naval Pier in Hama-cho.

Capt. Sakamoto, who later rose to be Vice-Admiral, was then superintending the mine-sweeping operations and had also charge of the patrol service in coast waters. In what crude state, the harbor works were left by the Russians might be judged by the astonishment expressed by one of the Russian engineers, who had supervised the harbor works under Russian regime and visited Dairen several years ago. The harbor installations were found completely mystifying to this engineer. Try how he might, he could hardly tell just exactly where he had left his work cut short.

Thus, the Japanese might justly boast of having completed the harbor installations of this port.

In fact, as the Japanese Army came in, the only thing approaching completion was the Second Wharf for the berthing of the regular steamers. As the vertical facing of the Wharf had steps under water, even ships of 4,000-5,000 tons could be brought alongside the quay with more or less difficulty. This could be said of the eastern side of the Wharf. On the opposite or western side, the steps were made with concrete blocks, and on this account, even steam-tenders could not be put alongside, except at one place where a sort of bridgework projecting about 30-ft. outward existed for mooring a 2,000 ton class steamer and for loading and unloading cargoes.

Most of the corrugated iron goods-sheds, painted green, that then stood along the quay wall were found razed to the ground. Several cavities excavated for laying subterranean-mines were discovered. The Russians had evidently made an attempt at blowing up the Wharves, but, luckily to the Japanese, failed.

As to the First Wharf, its wall facing east was found almost finished, but on the west side of the wall, small craft employed in harbor construction found a place of rendezvous.

Along the seashore running from the north of the Nisshin Oil Mills not far from the entrance to the Wharf Compound, it was merely a stretch of steep cliffs, along the foot of which ran a foot-path for the fishermen and coolies to follow eastward to Jijiko. To visit Hama-cho (containing the Docks and the Harbor Works Office, then the Harbor Master's Office) from the Wharf, one had to thread one's way along the seashore running parallel to Terauchi-dori and Kambu-dori (tram road running past the Post Office). A few small rivers had to be crossed.

About the Wharf, everything was left only partially done. The present site of the extensive Wharf Office Building was a pool of about 20,000 tsubo that had to be reclaimed.

Such was how Dairen Wharves stood or, more properly speaking, lay at the time of the Japanese occupation.

The pier was barely sufficient for berthing and unberthing military transports.

The O.S.K. Dairen liners had to use a head that jutted out northeast of the present Junk Wharf, and has been levelled and excavated away subsequently.

The extensive compound of the Dairen Wharves, including their warehouses covering hundreds of thousands of "tsubo" and the large open storage ground stretching a few miles from east to west, with all the expensive equipments and installations, has been obtained by reclamation at tremendous costs by the S.M.R. Co.

Standing on Dairen pier and looking about southwestward, one could only see that the levelling work had progressed only as far as the rear of the present Yamato Hotel, with wooden posts indicating the roadplans scattered about here and there. It was nothing but a level plain, on which the grass grew rank. The only edifice that caught the eye were the old building of the Marine Association, another used as Police Office behind the Produce Exchange, the Russo-Asiatic Bank left incomplete, and the Chinese theatre (now fallen into a bad dilapidated condition) at Fushimidai. The Administration Quarter, now known as Russia-machi on the north side of Nippon Bridge, was the only quarter that wore an aspect of completeness.

To the Japanese eye of twenty years ago, the clusters of the Russian buildings in Russia-machi appeared fine specimens of Western architecture.

Few people could be expected to hear without giving a cry of wonder the story of a stone-quarry hill having its top excavated off to give space for a fine garden after having a layer of good earth.

As to the telegraph and telephone and electric lighting services, the base of each square post consisted of an iron post, about 3 ft. high, fixed into the ground with concrete. These posts stood inside the fencewalls to save the streets from the vista of bristling cedar logs as at present. Then, concerning the shade trees lining the chief streets, at a few places, a single tree was protected with an iron fence that cost more than Y.200. Russia-machi had already water laid on, with a good drainage equipment. Only buildings gutted by fire could be seen here and there. The City Hall was found totally destroyed. The Mayor's Mansion (the present Presidential Mansion) and the Russian Cathedral (pulled down several years ago) were the only edifices preserved intact.

Once, out of the Administration Quarter (Russia-machi), one might feel oneself in quite a different part of the country. There were dirty vermin-ridden Chinese huddled together here and there, living in the open air.

There stood like the teeth of broken combs flat brick buildings and shack-houses about Kambudori (running past the Post Office) along Oku-machi and Togo-cho, to Nippon Bridge, then turning south to Oyama-dori and also along Ise-machi, the street running next on the west.

A good idea of what Dalny looked like as the Russians left it may be had from the picture given elsewhere.

About the middle of 1905, the Kwantung Civil Administration Office was established at Dairen to take the place of the Military Administration Office and the port was thrown open to Japanese visitors. Thus the flood-gate of entrance was opened to admit visitors of both sexes and of all classes. The City, still in its embryonic state, was found short of housing accommodation. Some rented Chinese dwellings at almost fictitious rents. Others had crude shack houses put up hurriedly. So by 1906 an excuse of a Japanese town was brought into existence along Mino-machi (along the brink of the declivity opposite the Railway Station), Shinano-machi, and Nishi-dori, the street connecting the Market Place with West Circle.

However, in 1907, the site of Central Circle was still covered with weeds and dirt. The hills behind the Yamato Hotel were found with fissures and crevices after much excavation work had been done. Kirishima-cho, running south in the rear of the Hotel, was then only a deep ravine.

When, prior to this, the Tokyo Government had discussed on what plan the port of Dairen rechristened Dalny should be developed, the questions arose whether the original Russian plan should be taken over and carried out, or whether a new scheme should be drafted consistently with the national resources after the exhausting war.

Those whose attention was focused on the exhausted resources and financial status of the nation vehemently attacked the folly of adopting the Russian plans in harbor construction and town-planning. They were on the point of tipping the balance in their favor when the late Gen.-Count Kodama (the mourned father of H.E. Gov. Count Kodama), the very brains that had engineered the Russo-Japanese War, stoutly opposed the negative policy from an international standpoint. He won over one Minister after another of the Cabinet to his side, and Government at last decided to make the Civil Governor of Kwantung construct the City of Dairen according to the old Russian plan. The General well might claim the credit for his far-sighted policy, to which the present City of Dairen, with its population of 250,000 and harbor admitted as the foremost in the Orient, that might be shown to the world as a modern city of which its author and builder well might be proud owes its existence.

The policy of constructing the city of Dairen was sanctioned by H. late M. Meiji Tenno. The Kwantung Administration authorities concerned were the party on which rested the onus of carrying out the grand plan of town-building. They had only Y.3,500,000 in appropriation a year, to administer the Leased Territory and, at the same time, to construct the splendidly-planned city. Money had no doubt greater purchasing power twenty years ago, but the authorities had a deep riddle to solve with the limited funds at their command. They could easily tell that they had to draw on the local taxes for necessary funds. But the City of Dairen had hardly 30,000 people therein, the majority of whom were Japanese and Chinese workmen. The incoming Japanese brought over by each steamer were also mostly empty-handed fortune-hunters.

The Government people hit upon the plan of manufacturing 100,000,000 kin of salt to hand a portion thereof to the Chinese authorities, exporting the rest to Japan. This scheme was dashed to pieces when the Finance Ministry established the salt monopoly. Next a lottery system was permitted, but it was so small in scale that what profit could be realized therefrom sufficed only to pay the expenses for a charitable relief enterprise for the benefit of low class Chinese. This system was abolished at a protest from the Foreign Ministry.

The Opium Monopoly was then thought of, but it failed to prosper as well as in Formosa. It only went to fatten the contracting parties concerned.

In short, the financial condition of the Kwantung Administration grovelled in a wretched state. Nothing like the export of beans or bean milling industry was dreamed of. Some more enterprising Japanese planned to found bean mills to cater for the consumers of Bean Cake at home, but when the question how to dispose of bean oil was considered, none could feel warranted to embark on the venture. In the minutes for the commission to boom the City of Dairen, a longing hope was expressed that the port of Dairen might aspire some day to attract 500,000 tons vessels a year handling Y.50,000,000 worth of goods.

Just at this juncture, the Japanese in Manchuria could scan over the horizon in Japan's direction a bright gleam of hope. Simultaneously with the establishment of Government-General of Kwantung at Port Arthur, the South Manchuria Railway Company capitalized at Yen 200,000,000, the most extensive corporation of Japan having only a few peers in all the world was about to have its Headquarters at Dairen. What extravagant expectations this piece of news did awake in the hearts of the Japanese is really pleasant to recollect even. All the Japanese in Manchuria were wild with joy and felt quite resuscitated. In the course of only 20 years, the trade of South Manchuria has now grown up to Yen 800,000,000 a year, and Dairen now takes up the third place in the long list of ports in China.

The port of Antung may also be cited as another instance, in which the past 20 years has wrought a complete transformation.

Now, the Japanese in Manchuria exceed 200,000. They have made it possible to let fine modern towns seldom met with elsewhere in the Orient appear along the S.M.R. Lines south of Changchun, that used to be looked upon as one of the preserves belonging to the Manchu Court in bygone days. Of all these towns, the City of Dairen has made the most remarkable advance. The city of Dalny that awed the Japanese 20 years ago with the extensive scope of plan prepared by its Russian authors was got up for a population of 40,000.

At present, the City of Dairen is possessed of 250,000 residents with room for containing altogether 450,000 people.

Let us just recollect how the Japanese Civil Administration people, soon after the Japanese occupation of Dalny, hoped to make the port of Dairen one large enough to handle 500,000 tons of shipping a year. The annual total tonnage registered, that has access to the port of Dairen, now runs up to 7,000,000, raising this Port to take its place in the foremost rank of the ports in the Orient.

On shore, the city has a network of broad, perfect roads, equipped with grand systems of water and drainage works. The streets are lined with splendid edifices of modern designs. In fact, the city owns almost every concomitant of a civilized town.

It would be no empty boasting for the Japanese to point to the City of Dairen as the most striking achievement the Japanese have ever accomplished abroad.

What has made such an achievement possible in the space of the comparatively short period ? We have often heard a Western specialist give a cry of wonder at the phenomenal growth of the City, saying that such a city would require nearly one whole century to bring up and embellish.

First of all, the flesh and blood of the mourned heroes who were killed in the two Wars have laid the foundation for the present City.

In the second place, the Japanese in and out of Government service who have contributed perseveringly towards building up the magnificent structure during the past 20 years, may claim a lion's share of the credit.

Behind them, however, stands towering and absolute the South Manchuria Railway Co. that, with the capital of Y.420,000,000, has been spending over a dozen millions of yen annually for developing the country.

It is a stern fact that the Railway has been investing in Manchuria the larger portion of its profit money deducting only a 10 per cent. annual dividend to its shareholders other than

Government and a certain amount of contribution to the Government on its own shares.

When what capital has been laid out by Government and private capitalists other than the Railway Company is summed up, the aggregate amount will go up to over Y.1,000,000,000.

It has taken all this enormous amount of money, not to mention the priceless blood and flesh offered as sacrifices, to transform Manchuria inhabited by wild beasts and overrun with brigands into a promising productive country recording its annual trade by Y. 800,000,000.

All the cities and towns along the S.M.R. Lines have been brought into existence as if by the waves of the magic wand.

We must proclaim to the world for its recognition the fact that as Manchuria becomes opened up more and more, the Chinese inhabitants will appropriate the best of the benefits, leaving the Japanese belonging to the country that has laid out all the sacrifices and money sadly ill provided.

20 years ago, the Chinese farmers along the railways lived mostly in lowly mud-huts or "dug-outs." Contrast them with the clusters of the decent-looking brick and stone houses roofed with tiles, to which their Japanese brother-farmers in Japan can not hold a candle.

In the City of Dairen itself, the Chinese stores and shops are on the increase everywhere, especially in the heart of the business district. They look the more prosperous and really better-stocked. Then as regards real estate in the City, more land and buildings are being purchased by the Chinese year by year.

20 years ago, the Chinese were compulsorily grouped together at what is known now as Shokoshi (Chinese Quarter), detested by every White man for their unsanitary, vermin-ridden and foul-smelling persons. It has now blossomed into a respectable and flourishing town. The most marvellous of all is the fact that many foremen of coolies that served under the Russian regime and the early Japanese Administration are now waddling in luxury as millionaires.

This is not true only with Dairen, but also with everywhere else along the Railways, only on a smaller scale.

The characteristic thrift and industry of the Chinese, contented with the humblest living, is the strongest factor that has wrought such a wonder.

The Japanese are only pleased to see the native Chinese thrive through the Japanese instrumentality.

However, a considerable portion of the enormous wages earned by the Chinese coolies is taken back to Shantung by them. Then, the prices of the produce paid to its growers, Chinese farmers, is liable to be hoarded idle for the mere love of money, without circulating again in the market.

To put it in a nutshell, the Chinese in Manchuria other than residing in a city remain contented with the low living of 20 years ago, while they draw an income from 10 to 15 times over, which, however, they hoard underground. Thus, their purchasing ability does not rise in proportion to their increased incomes.

Therefore, from a point of view of business, pure and simple, and also the interest money on the capital, the investments in Manchuria are unquestionably the poorest. The S.M.R. Co. has been clearing 10 per cent. returns on its share capital other than the Government shares. But the other enterprises are mostly profitless or losing ones. If things should go on as they have been doing, the Japanese capital laid out in Manchuria to the extent of Y.1,000,000,000 could never be recouped till the Greek Calendar. Under all these circumstances, the Government is actually administering Kwantung Leased Territory on the annual Budget of more than Y.10,000,000. In addition, for the benefit of the S.M. Railway Area, the S.M.R. Co. is disbursing more than dozen millions of yen a year.

What have the Japanese ever gained for all these ?

While the Japanese are being barred out of the door of a number of countries abroad, 200,000 fellow-countrymen of ours may live in peace in South Manchuria, using their native tongue and national currency under the protection of the Japanese law. This is the only thing gained by Japan in Manchuria.

In a word, the Japanese mean nothing else beyond striving to solve the food-stuff and the surplus population problem in Manchuria.

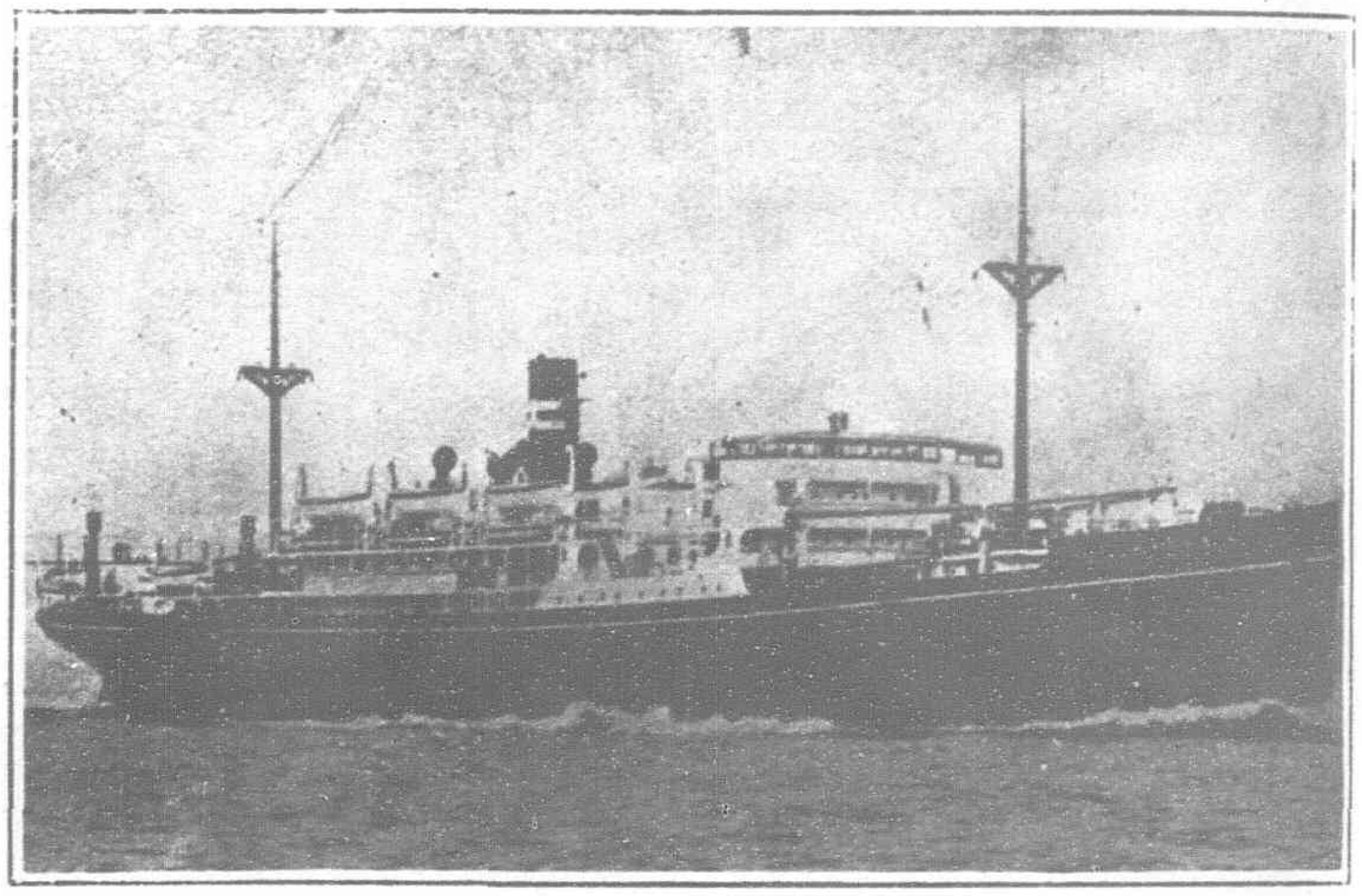
For the sake of these two problems, the Japanese are putting forth their utmost endeavors to open up Manchuria and Mongolia, determined to overcome all difficulties, with the fidelity of a faithful tenant to the land-owner, even without thinking of the recouping of the big capital of Y.1,000,000,000.

This endeavor makes the muscles or sinews of the so-called Sino-Japanese solidarity, the popular cry on the lips of the Japanese in Manchuria.

M. S. "La Plata Maru"

THE *La Plata Maru* which was first called the *Manila Maru* was built by the Sulzer licensees, the Mitsubishi Dockyards Nagasaki, for the Osaka Shosen K.K. Nagasaki. It is a 6,800-ton passenger-cargo boat, propelled by two ST60 engines (2,300 b.h.p. each, at 112 r.p.m.) and is identical with the M. S. *Santos Maru* and the *Montevideo Maru* (Ex *Hawaiian Maru*).

The first trials of the *La Plata Maru* were run on March 29 and 30 and a Sulzer engineer, who was present, writes that the machinery worked highly satisfactorily. After a short preliminary run at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and full load, the speed trials were run on the measured mile and gave the following results :—



New O.S.K. Steamer "La Plata Maru"

		Load on Main engines				
		1/4	2/4	3/4	4/4	overload
Speed of ship	.. Knots	10.65	13.34	14.76	16.05	16.61
Speed of engines	.. r.p.m.	74	95	106	117	121
Total output of main engines	.. b.h.p.	1,083	2,318	3,290	4,570	5,100

At the overload trials the exhaust was quite invisible. For Lloyd's Surveyor 24 manœuvres were carried out with the reserve starting air. The lowest pressure at which the engines were started was 6 atm. (abt. 85 lbs./sq. in.).

New Coastal Vessel for Malacca Trade

A contract has just been placed by Messrs. Hendry Bros., of London, with the Caledon Shipbuilding and Engineering Company, Ltd., for the construction of a new vessel for the coastal service in the Straits of Malacca.

Large Order for Electric Locomotives

A contract has lately been secured by the Metropolitan-Vickers Electrical Company, Manchester, from the Great Indian Peninsula Railway, for forty-one electric locomotives, each weighing 115 tons and rated at 2,600-h.p. The total value of the order is in excess of £600,000. The tender of the same firm for £104,693 for switchgear, has been recommended for acceptance to the Sydney City Council, New South Wales.

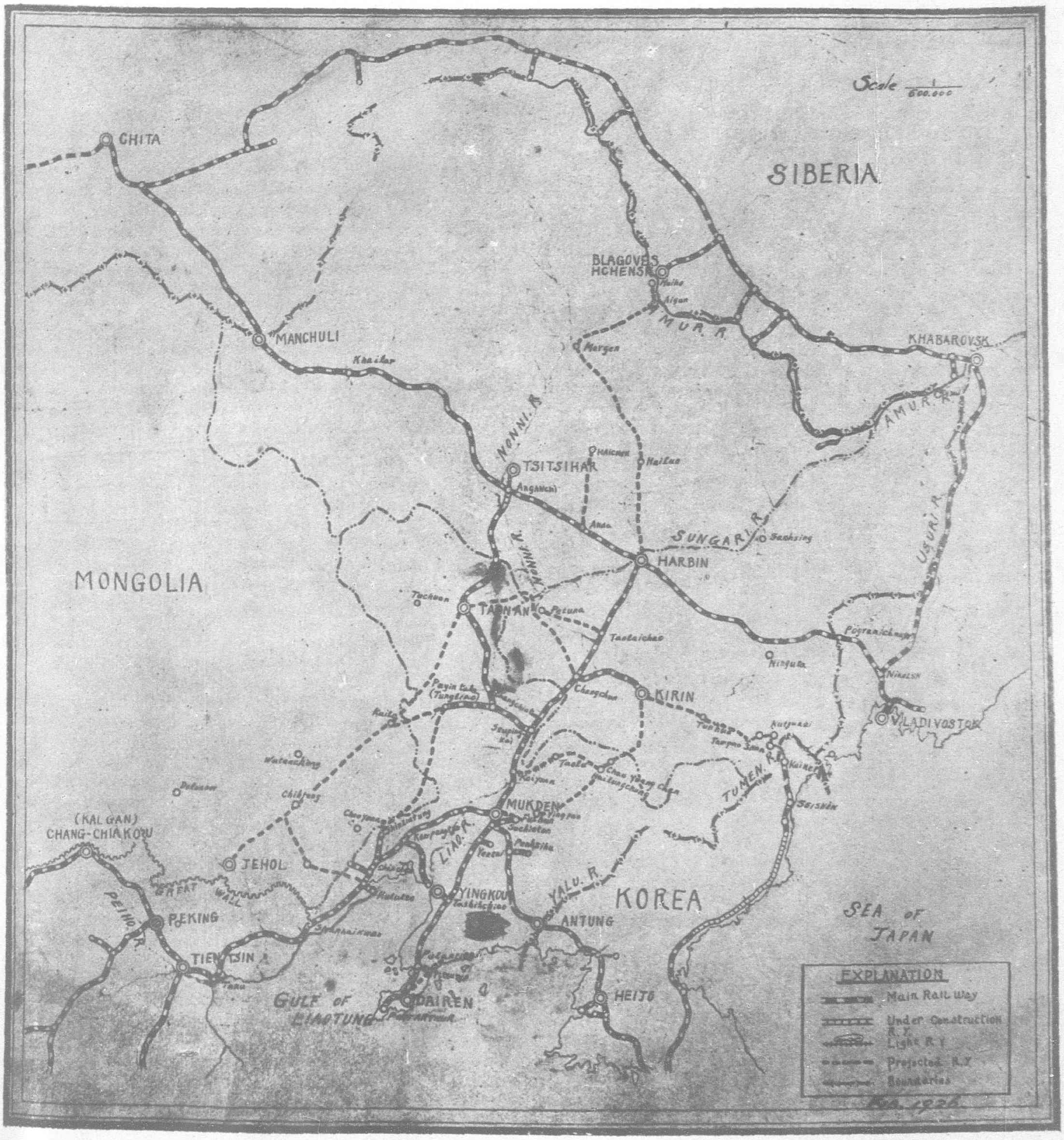
The New Railways of Manchuria

THE following summary of the railway situation in Manchuria is not official but it shows what is being done. The Chinese themselves own the new railways in Manchuria, and they have of recent years shown much interest in building new lines. This is due not only to the fact that in this way the country is being developed and general prosperity and, consequently, the government revenues are increased, but also to the fact that individual Chinese high officials have found that much profit may be derived from opening railways through lands which they already hold or acquire for the purpose, the increased value of such being, of course, productive of great and immediate returns.

The Chinese authorities have borrowed funds from Japanese capitalists but from the contracts, it will be seen what a small measure of control, the Japanese capitalist have in the management of the railways.

Hulan-Hailun

This line is being built by the Chinese, with Mr. Ostroumoff, formerly (White Russian) manager of the Chinese Eastern Railway as engineer in charge of construction, the funds being furnished by the Heilungkiang Government and also by Governor Wu from his personal funds. The section from Hulan to Suihua, 50 miles in



length, is, it is understood, to be completed by the end of 1926, while the section from Suihua to Hailun, 62 miles in length, is to be finished later. Governor Wu plans to extend this system further northwards and westwards and eventually, probably, to connect it with a line running north from Tsitsihar towards Blagoveshensk, this additional development being, he states, dependent on the matter of funds. This is thus entirely a Chinese enterprise, and the only connection which the Japanese have therewith lies in the fact that the South Manchuria Railway Co. acts as a purchasing agent for certain materials, its only specific interest lying, however, in the fact that this line is being constructed on standard gauge, the same as the Chinese Government Railways and the lines of the S.M.R., and not on the five foot gauge employed by the Russian State Railways and the Chinese Eastern line. It may be mentioned that American firms have obtained large contracts for delivery of materials for this line.

Ssupingkai-Chenchiatun-Paiantala-Taonan-Anganchi Lines

These lines were built at various times under a series of separate agreements which may be summarized as follows:

Ssupingkai-Chenchiatun

This line was financed under an agreement, in 1915, between the Chinese Government and the Yokohama Specie Bank, to the interests of which the S.M.R. later succeeded. In accordance with this, a loan of Y.5,000,000 was actually floated, and the rest of the money was advanced by the S.M.R. and forms part of a Y.32,000,000 loan later advanced by the S.M.R. The terms of this agreement were essentially the same as those of the Chenchiatun-Taonan agreements. Both agreements provided that the S.M.R. or the Yokohama Specie Bank respectively should act as purchasing agents. The line was built by the Chinese. Interest has been paid on the Y.5,000,000 loan, but the interest accruing on the other advances has year by year been added to the principal. This line should be able to pay interest this year, though no inclination to do so is apparent, and the matter is now being taken up by the Japanese with the Peking Government. Owing, however, to the shadowy form of control of Peking, it is questionable if any order from it that the interest be paid would be obeyed. If interest be added constantly to the principal, the total will soon exceed the value of the railway property in which case Japan will benefit only from the fact that the line acts as a feeder to the S.M.R.

Later this contract was merged with that of the Chenchiatun-Taonan-Paiantala contract (which will be described in the next paragraph) and the arrangement for representation of the Japanese interests are consequently the same for the entire Ssupingkai-Chenchiatun-Paiantala-Taonan section, as will be set forth in the following paragraph.

Chenchiatun-Taonan-Paiantala

The Ssupingkai-Chenchiatun line was continued by a branch to Paiantala and by an extension to Taonan. The S.M.R. was empowered, in 1919, by the Peking Government to float a loan for building these lines, the amount to be Y.45,000,000 at 5 per cent. interest, and with a term of 40 years. It was, however, impossible to float a loan at such a low interest rate, and as the agreement provided that in such contingency the S.M.R. should enter into an agreement to advance short term loans for the money needed, this course was taken. Under the original contract the S.M.R. was only to arrange the financing, the Chinese to build the road themselves, but it was found expedient, entirely outside of the contract, by the Chinese to contract with the S.M.R. for the building of part of the line. It was provided that during the construction the Chinese Bureau of Communications must engage a Japanese chief engineer with staff, but after its completion a Japanese maintenance engineer, chief accountant and traffic manager, should be recommended for appointment by the S.M.R. Under the short term loan arrangement, sums were advanced from time to time as construction progressed, and the loans were renewed from year to year, with interest due added, so that the sum total now due amounts to about Y.32,000,000. The interest was placed at a rate averaging 9 per cent. and was not unduly high at the time the loan was made. The security for this loan is the property and revenue of the railway and it is guaranteed by the income of the Central Government at Peking. At present the Bureau of Communications favors the floating of a loan of Y.45,000,000, but it is evident that the interest rate must be higher than the 5 per cent. provided in the original loan proposition, and, furthermore, the bankers interested want the amortization period shortened and also want the loan to be guaranteed by the S.M.R., so this matter remains in an indefinite state and the difficulties connected therewith are such that the outlook for realization of the proposition does not seem very promising.

Taonan-Anganchi

The Taonan-Anganchi agreement provides that the S.M.R. shall build a railway between the points mentioned, within a period of about two years, each section to be handed over to the Director General of the Railway Bureau when completed, the revenues accruing from traffic to be taken by the Railway Bureau. The Director is to purchase land, materials for construction and equipment with funds advanced by the S.M.R. In purchasing such articles from abroad, the practice is to be observed to buy in the open market at lowest rates for good quality, preference to be given to Chinese goods over Japanese or other foreign goods. The payment for the fulfillment of the contract is fixed at Y.12,920,000. Upon completion of construction, the provincial government is to pay that sum to the S.M.R., but any amount thereof which remains unpaid at the end of a period of six months from the date of transfer of the line shall be turned into a loan, for a period of forty years, and bearing interest at 9 per cent., to be paid from the revenues of the railway or from such other funds as the provincial authorities may elect. The principal of the loan shall be amortized in thirty years by installments, commencing from the eleventh year from the date of transfer, and on repayment of the principal the contract shall be invalidated. The contract will also be nullified at any time within the forty years when the complete principal and interest shall have been paid. The Chinese have, however, the right to redeem the loan at any time. The loan is secured by a lien on all the railway properties. The S.M.R. has the right to appoint an adviser who shall supervise for the Railway Bureau all expenditures and revenues of the railway and who shall countersign with the Director General all documents relating to its expenditures. He may engage not more than two Japanese assistants.

Kirin-Changchun

In 1908 an agreement was concluded between the Chinese Government and the South Manchuria Railway Company relating to the financing of the line between Changchun and Kirin, the entire sum required for the construction of this line being Y.4,300,000, half of which was advanced by the S.M.R., the remainder being furnished by the Chinese Government. The financing only was a joint enterprise, but the road was built and managed by the Chinese, though the chief engineer and chief accountant were appointed, one by the recommendation of the S.M.R. by the Chinese and the other by the recommendation of the Chinese by the S.M.R. Later, in 1917, a new loan was advanced by the S.M.R. in the sum of Y. 6,500,000, for a term of thirty years, the loan being issued at the rate of Y.91.50 per Y.100, with interest at 5 per cent., and part of this loan was applied to the payment of the original advance made by the S.M.R. At this time also the management of the line was entrusted to the S.M.R., which appointed a chief engineer, a traffic manager, and a chief accountant, and the number of Japanese employees was increased, although the Chinese remain the heads of the concern. The terms of this agreement have it that having "in view of the splendid results of the management of the South Manchuria Railway" the Chinese Government entrusts the mangement of the Changchun-Kirin Railway to the S.M.R. Interest on this loan has been paid as well as an annual payment of 20 per cent. of the net profits of the line, according to a provision contained in the new agreement. This arrangement has, however, not been as profitable as might appear owing to the fact that the profits, which were quite attractive during the war years, have fallen in recent years so that they amount now to about Y.400,000 annually, of which the share of the S.M.R. is about Y.80,000 a year. When one takes into consideration the extremely low interest rate of the loan compared to the rates of interest now prevailing and the rates being paid by the S.M.R. for its own loans, even as high as 9 per cent., the actual returns on this loan are not high, even in spite of the premium of issue. Furthermore, the S.M.R. has made it a practice to apply part of the amount of its share, voluntarily, to subsidies to schools in the region served by the line and for similar public benefits. It should also be noted that the new Kirin-Tunhua agreement contains a clause whereby the Chinese Government may propose to bring the entire line from Changchun to Tunhua under Chinese management when the new section has been completed.

Kirin-Tunhua

This line, which extends from the Kirin terminus of the Changchun-Kirin line in an easterly direction, is being built (Construction having begun in June, 1926) under a contract concluded between the Minister of Communications of the Chinese Government (Peking) and the South Manchuria Railway Co. under which the line is to be completed in about two years. The specified amount of the contract is Y.18,000,000 (without discount) which is to be advanced by the S.M.R. for construction and equipment at the request of the Chinese Director General. It is provided that in case unforeseen circumstances shall make it necessary, this amount may be increased by agreement. Interest is fixed at 9 per cent. The (Chinese) Director General is to control the entire business of this line, but shall engage a Japanese chief engineer of the S.M.R. service who shall retire when construction has been completed, and who shall, under the direction of the Director General, attend to the construction and countersign all documents relating to receipts and expenses. The chief engineer may, at the request of the Director General, employ Japanese assistants. The chief engineer shall, with the approval of the Director General, purchase materials, and it is provided that where Chinese materials are equal in quality and price to those of Japanese or other manufacture, the former shall be given preference. In construction Chinese contractors are also to be given preference. On completion the Director General shall open the line for traffic and conduct it, with full authority, under the general rules of the Chinese State Railways, but he shall engage a Japanese chief accountant, who shall have charge of the accounts, following the rules of the Chinese State Railways, and who shall countersign all documents relating to receipts and expenditures. His tenure of office shall extend until the advances made by the S.M.R. shall have been paid in full. Such payment is to be made upon acceptance of the line on its completion, but in case such payment, in part or in full, shall not be made then, the Minister may postpone payment, for which the property of the railway shall be security. In such case payment is to be made in installments within 30 years or at any earlier date, but the Chinese have the right to repay the loan at any time. The receipts of the road are to be deposited by division in Chinese and Japanese banks.

General Remarks

It may be noted that of the contracts concluded between the Japanese and Chinese authorities, those of an early date are more advantageous to Japan than those following. The early agreements strove to follow the terms usually included in such contracts between other nationals and the Chinese in other parts of China, such as, for instance, the Tientsin-Pukow line contract. The contracts made by the Japanese in later years show, however, a decreasing number of safeguards and a decreasing measure of influence in the affairs of the lines for which loans have been advanced. It will thus be seen that the administrative officials remain Chinese and that (with the exception of the Changchun-Kirin line in which a special, temporary, contract for the management of the line has been entered into under the conditions specified heretofore) such Japanese accountants and others as are employed have no power of initiative but only that of countersigning vouchers and the like.

It is worthy of note that the contracts which contain the provision whereby the Peking Government guarantees the payment of the loan from its revenues, must, in the light of the chronically impecunious condition of the Peking treasury, seem almost an irony.

To sum up then, it is evident that such "control" as the Japanese have in the Chinese lines in which they have become interested by money advances is nominal rather than practical, and, further, that the terms of the loans are far from attractive; at least, they are far less so than are those of the loans furnished by various European interests for railroad enterprises in other parts of China; and the benefits which the Japanese draw from them lie, not in any financial returns from the loans nor in control of the roads which have been built through these means, but in the admittedly important consideration that these lines operate as feeders to the main system of the South Manchuria Railway and thus contribute substantial increases to the freight volume which it carries.

"Agreement Between the Government of the Union of Soviet Socialist Republics and the Government of the Autonomous Three Eastern Provinces of the Republic of China"

(Rosta Service) Signed at Mukden, October 8, 1924.

Peking, October 7:—In view of the large amount of interest in the Mukden agreement, the Rosta News Agency is in a position to publish the following text, which is one of the final draft as co-ordinated by both Parties and signed at Mukden. However, original signed document has not yet been received at Peking, so that in the text that follows the names of those who signed it as well as some other details have naturally been omitted.

The Government of the Union of Soviet Socialist Republics and the Government of the Autonomous Three Eastern Provinces of the Republic of China, desiring to promote the friendly relations and regulate the questions affecting the interests of both Parties, have agreed to conclude an Agreement between the two Parties, and to that end named as Plenipotentiaries, that is to say:

The Government of the Union of Soviet Socialist Republics: . . .

The Government of the Autonomous Three Eastern Provinces of the Republic of China: . . . .

Article I—The Chinese Eastern Railway

The Governments of the two Contracting Parties agree to settle the question of the Chinese Eastern Railway as hereinafter provided:—

(1) The Governments of the two Contracting Parties declare that the Chinese Eastern Railway is a purely commercial enterprise.

The Government of the Contracting Parties declare that with the exception of matters pertaining to the business operations which are under the direct control of the Chinese Eastern Railway, all other matters affecting the rights of the National and the Local Governments of the Republic of China such as judicial matters, matters relating to civil administration, military administration, police, municipal government, taxation and landed property (with the exception of lands required by the Chinese Eastern Railway itself) shall be administered by the Chinese Authorities.

(2) The time-limit as provided in Article XII of the Contract for the Construction and Operation of the Chinese Eastern Railway of September 8, 1926, shall be reduced from eighty to sixty years, at the expiration of which the Government of China shall enter gratis into possession of the said Railway and its appurtenant properties.

Upon the consent of both Contracting Parties, the question of a further reduction of the said time-limit (that is, sixty years) may be discussed.

From the date of signing the present agreement the Union of Soviet Socialist Republics agrees that China has the right to redeem the Chinese Eastern Railway. At the time of redemption, the two Contracting Parties shall determine what the Chinese Railway had actually cost, and it shall be redeemed by China with Chinese capital at a fair price.

(3) The Government of the Union of Soviet Socialist Republics agrees in a Commission to be organised by the two Contracting Parties to settle the question of the obligations of the Chinese Eastern Railway Company in accordance with Section IV of Article IX of the Agreement on General Principles for the Settlement of the questions between the Union on Soviet Socialist Republics and the Republic of China signed on May 31, 1924, at Peking.

(4) The Governments of the two Contracting Parties mutually agree that the future of the Chinese Eastern Railway shall be determined by the Union of Soviet Socialist Republics and China to the exclusion of any third party or parties.

(5) The Contract for the Construction and Operation of the Chinese Eastern Railway of August 27/September 8, 1896, shall be completely revised, in accordance with the terms specified in this Agreement, by a Commission of the two Contracting Parties in four months from the date of signing the present Agreement. Pending the revision, the rights of the two Governments arising out of this Contract, which do not prejudice China's rights of sovereignty, shall be maintained.

(6) The Railway shall establish, for discussion and decision of all matters relating to the Chinese Eastern Railway, a Board of Directors to be composed of ten persons, of whom five shall be appointed by the Union of Soviet Socialist Republics and five by China.

China shall appoint one of the Chinese Directors as President of the Board of Directors, who shall be ex-officio the Director-General.

The Union of Soviet Socialist Republics shall appoint one of the Russian Directors as Vice-President of the Board of Directors, who shall be ex-officio the Assistant Director-General.

Seven persons shall constitute a quorum, and all decisions of the Board of Directors shall have the consent of not less than six persons before they can be carried out.

The Director-General and the Assistant Director-General shall jointly manage the affairs of the Board of Directors, and they shall jointly sign all the documents of the Board.

In the absence of either the Director-General or the Assistant Director-General, their respective Governments may appoint another Director to officiate as the Director-General or the Assistant Director-General (in the case of the Director-General, by one of the Chinese Directors, and in that of the Assistant Director-General, by one of the Russian Directors).

(7) The Railway shall establish a Board of Auditors to be composed of five persons, namely, three Russian Auditors, who shall be appointed by the Union of Soviet Socialist Republics, two Chinese Auditors, who shall be appointed by China.

The Chairman of the Board of Auditors shall be elected from among the Chinese Auditors.

(8) The Railway shall have a Manager, who shall be a national of the Union of Soviet Socialist Republics, and two Assistant Managers, one to be a national of the Republic of China.

The said officers shall be appointed by the Board of Directors and such appointments shall be confirmed by their respective Governments.

The rights and duties of the Manager and the Assistant Managers shall be defined by the Board of Directors.

(9) The Chiefs and Assistant Chiefs of the various departments of the Railway shall be appointed by the Board of Directors.

If the Chief of a department is a national of the Union of Soviet Socialist Republics, the Assistant Chief of that department shall be a national of the Republic of China, and if the Chief of a department is a national of the Republic of China, the Assistant Chief of that department shall be a national of the Union of Soviet Socialist Republics.

(10) The employment of persons in the various departments of the Railway shall be in accordance with the principle of equal representation between the nationals of the Union of Soviet Republics and those of the Republic of China.

(Note :—In carrying out the principle of equal representation, the normal course of life and activities of the Railway shall in no case be interrupted or injured, that is to say, the employment of the people of both nationalities shall be based in accordance with experience, personal qualifications and fitness of the applicants).

(11) With the exception of the estimates and budgets as provided in Section XII of Article 1 of the present agreement, all other matters on which the Board of Directors cannot reach an agreement, shall be referred to the Governments of the Contracting Parties for a just and amicable settlement.

(12) The Board of Directors shall present the estimates and budgets of the Railway to a joint meeting of the Board of Directors and the Board of Auditors for consideration and approval.

(13) All the net profits of the Railway shall be held by the Board of Directors and shall not be used pending a final settlement, in a joint Commission, of the question of its distribution between the two Contracting Parties.

(14) The Board of Directors shall make a complete revision, as soon as possible, of the statutes of the Chinese Eastern Railway Company approved on December 4, 1896, by the Tsarist Government in accordance with the present Agreement and not later than four months from the date of the constitution of the Board of Directors.

Pending their revision, the aforesaid statutes, insofar as they do not conflict with the present Agreement and do not prejudice the rights of sovereignty of the Republic of China, shall continue to be observed.

(15) As soon as the conditions of the redemption by China of the Chinese Eastern Railway are settled by both Contracting Parties, or as soon as the Railway reverts to China upon the expiration of the time-limit as stipulated in Section II of Article 1 of the present Agreement, all parts of this Agreement concerning the same shall cease to have effect.

Article II—Navigation

The Governments of the two Contracting Parties agree to settle, on the basis of equality, reciprocity and the respect of each other's sovereignty, the question relating to the navigation of all kinds of their vessels on those parts of the rivers, lakes, and other bodies of water, which are common to their respective borders, the details of this question to be regulated in a Commission of the two Contracting Parties within two months from the date of signing the present Agreement.

In view of the extensive freight and passenger interests of the Union of Soviet Socialist Republics on the River Sungari up to and including Harbin, and the extensive freight and passenger interests of China on the lower Amur River into the sea, both Contracting Parties agree, on the basis of equality and reciprocity, to take up, the questions of securing the said interests in the said Commission.

Article III—Boundaries

The Governments of the two Contracting Parties agree to redemarcate their boundaries through a Commission to be organised by both Parties, and, pending such redemarcation, to maintain the present boundaries.

Article IV—Tariff and Trade Agreement

The Governments of the two Contracting Parties agree to draw up a Customs Tariff and conclude a Commercial Treaty in a Commission to be organised by the said Parties on the basis of equality and reciprocity.

Article V—Propaganda

The Governments of the two Contracting Parties mutually pledge themselves not to permit within their respective territories the existence and/or activities of any organisations or groups whose aim is to struggle by acts of violence against Government of either Contracting Party.

The Governments of the two Contracting Parties further pledge themselves not to engage in propaganada directed against the political and social systems of either Contracting Party.

Article VI—Commissions

The Commissions as provided in the Article of this Agreement shall commence their work within one month from the date of signing this Agreement, and shall complete their work as soon as possible and not later than six months. This does not apply to those Commissions, whose time-limits have been specified in the respective Articles of this Agreement.

Article VII

The present Agreement shall come into effect from the date of signature.

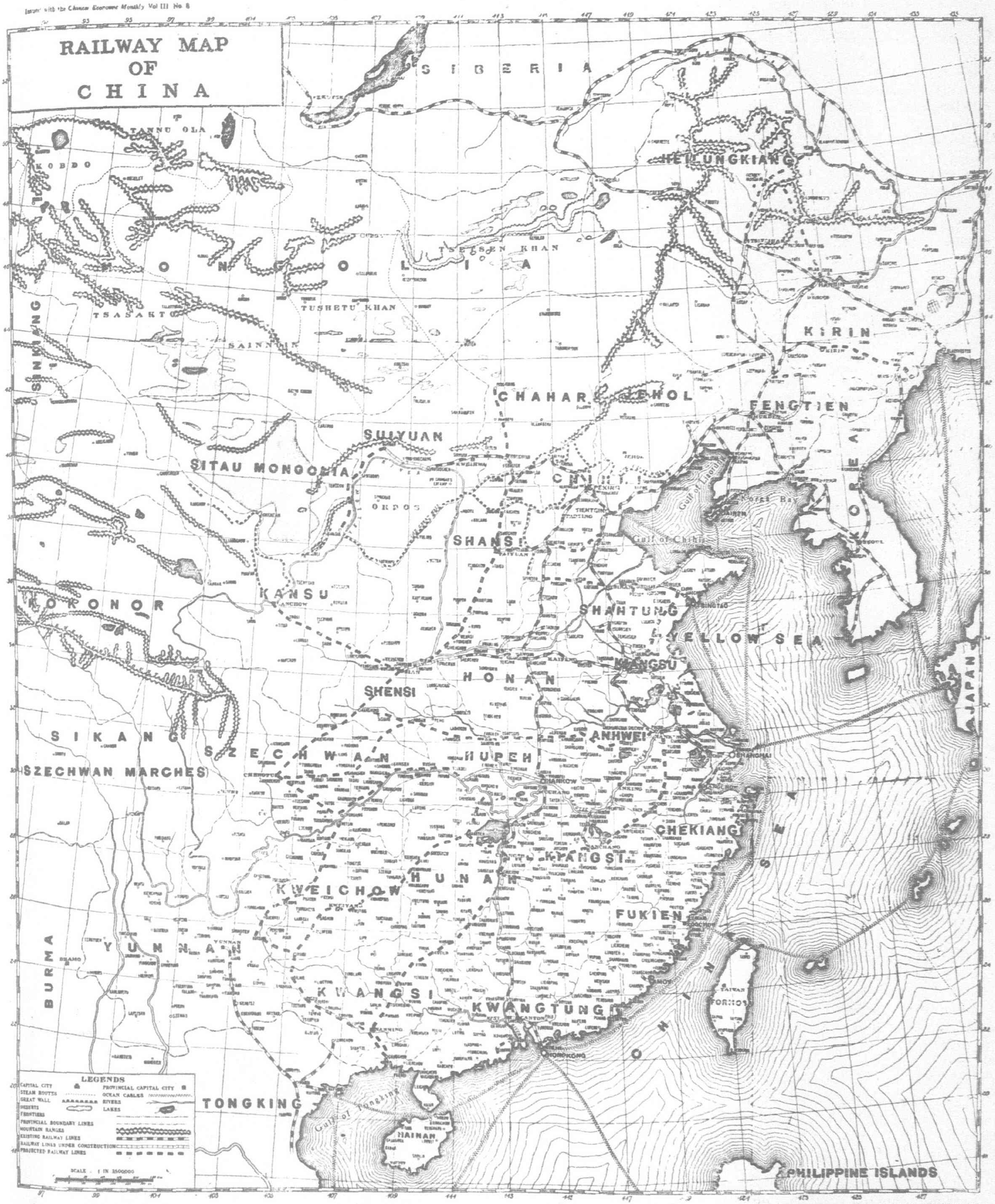
In witness whereof, the respective plenipotentiaries have signed the present Agreement in duplicate in the Russian, Chinese and English languages, and have affixed thereto their seals.

In case of dispute, the English text shall be accepted as the standard.

Done at the City of Mukden this Day of One Thousand Nine Hundred and Twenty-four, which is the Day of the Month of the Thirteenth Year of the Republic of China.

Supplement No 23

Issued with the Chinese Economic Monthly Vol III No 8



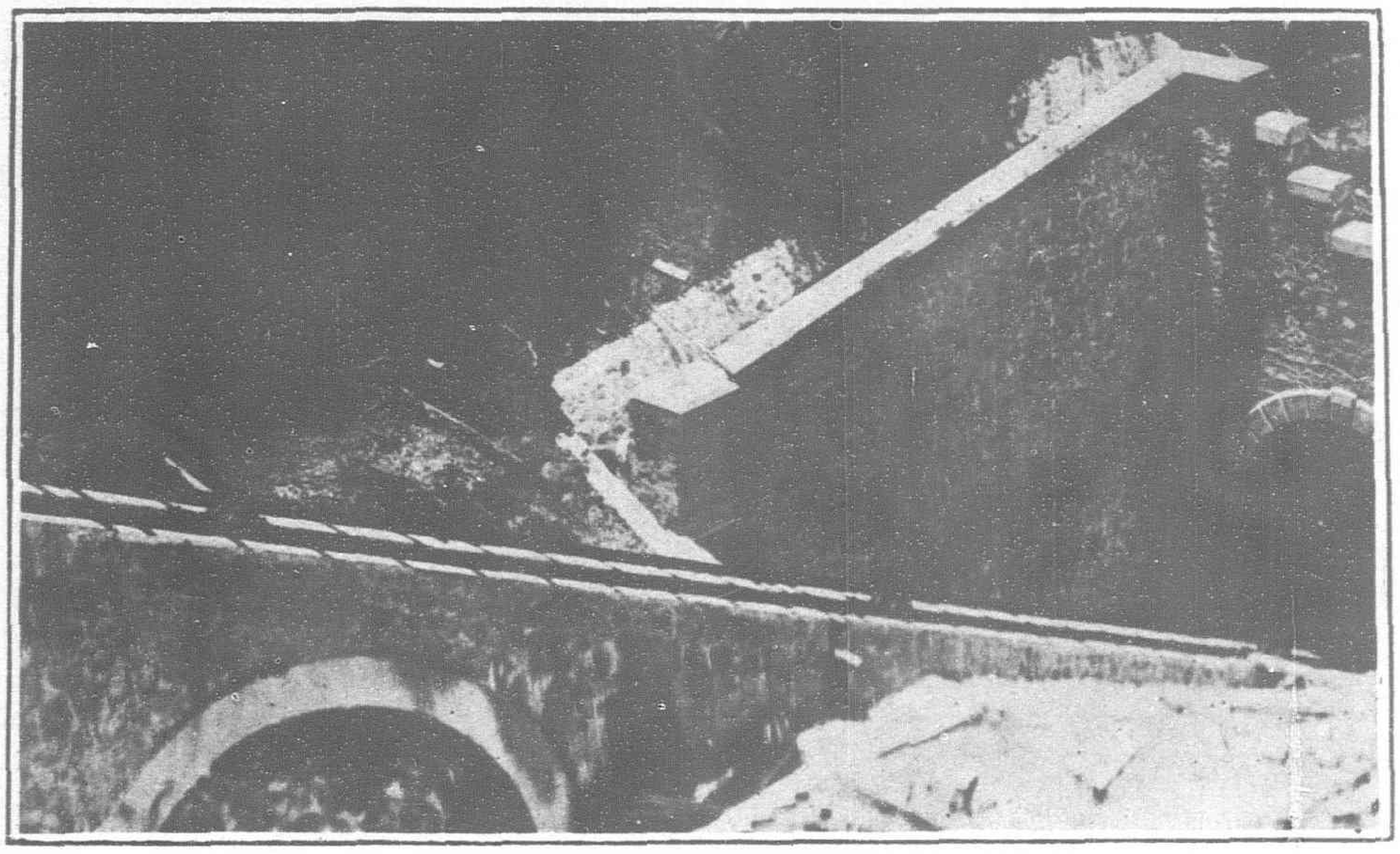
BUREAU OF ECONOMIC INFORMATION

Federated Malay States Railways

A SUMMARY of his Annual Report for 1925 has been forwarded to us by Mr. J. W. Spiller, M.I.C.E., Acting General Manager and Chief Engineer, Federated Malay States Railways.

The period which the report covers has been one of great prosperity in the tin and rubber industries, the most important in British Malaya, and this state of affairs is clearly reflected in the increased railway tonnages and receipts reported below.

Receipts from all sources amounted to $18,743,352 an increase of 15.63 per cent. and of $2,533,150 over 1924. Passenger receipts increased by $995,140 (16.41 per cent.) to $6,775,898, and number amounted to over 12½ millions, shewing an increase of 1,738,000 over the previous year. In view of the severe and increasing competition by road motor services, these results can be considered very satisfactory. The number of passengers carried is the greatest since the 'boom' year 1920. Passenger fares are very cheap in Malaya, being 1¾d. p.m. 1st class ; .84d. p.m. 2nd class and .56d. p.m. 3rd class.



Penang Hill Railway Upper End Tunnel

Goods train receipts shew an increase of $1,135,600 (14.18 per cent.), totalling $9,141,342, the most important tonnage increases being

Merchandise	123,409 tons	17,13%
Rubber	15,640 „	14.89%
Coal, Coke and Firewood ..	17,054 „	2.88%
Live Stock (24,000 Heads) ..	240 „	13.62%

Receipts from Merchandise, Live Stock, Tin, Coal, Coke and Firewood, Other Minerals, Mails, Parcels and Live Stock are the highest recorded to date.

The total expenditure under Capital Account to December 31, 1925, is $199,700,249, of which only $27,101,148 has been provided from Loan Funds. During 1925, the net addition to Capital Expenditure was $3,929,107.

Revenue expenditure on all accounts amounted to $13,973,036, an increase of $1,041,262 (8.05 per cent.) over 1924.

Total expenditure in respect of Railway working shews an increase of $1,033,869 (8.99 per cent.) compared with 1924 but the percentage to the total traffic receipts has decreased from 86.22 per cent. in 1923 to 78.62 per cent. in 1924 and to 74.42 per cent. in 1925.

A net profit for the year is recorded of $4,770,316 (2.39 per cent. on Capital expenditure) compared with $3,278,428 in 1924 and $1,710,349 in 1923.

Expenditure on construction and surveys during the year amounted to $3,787,142 compared with $3,918,237 in 1924.

Good progress is reported in connection with the East Coast Railway both in Kelantan and Pahang States. Five large bridges were completed during the year. At the bridge over the Sungei Pahi, a 100 ft. girder was launched whole. There was some shortage ofl abour owing to the demand on rubber estates and tin mines.

The East Coast line diverges from the main West Coast line Singapore to Penang, at Gemas, on the Negri Sembilan—Johore border, and proceeds in a North Westerly direction through Negri Sembilan and Pahang towards Tumpat in Kelantan.

It is completed and opened for traffic as far as Chegar Perah, 22 miles beyond Kuala Lipis, the capital of Pahang, and 164 miles from Gemas. At the end of 1925, the permanent way had been laid as far as the 182nd mile—5 miles from the Kelantan-Pahang Border. A section of 53 miles in Kelantan between Tumpat and Krai is open for traffic.

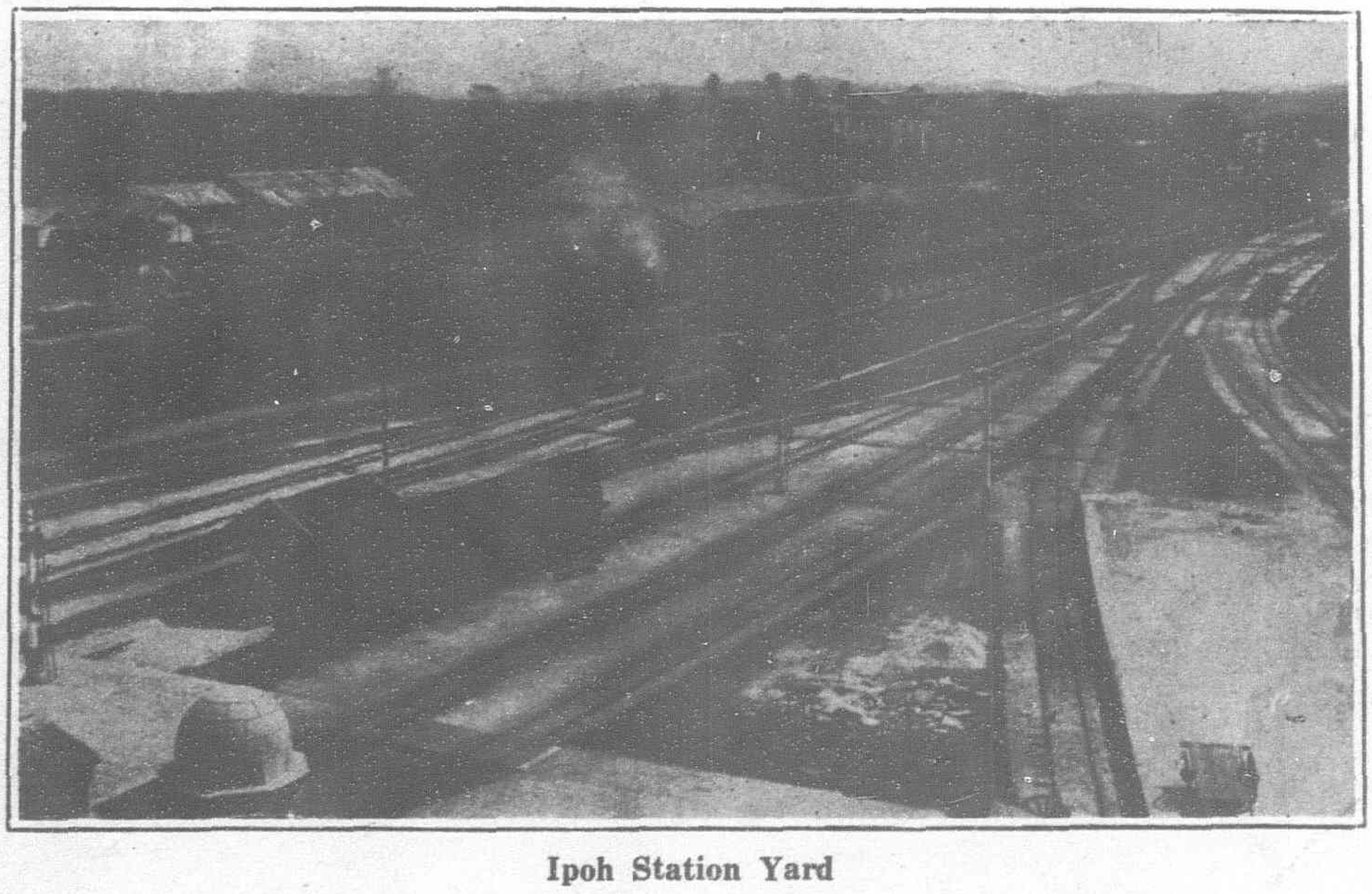
At the end of 1925, railhead in Kelantan was at the 68th mile and earthwork, etc. was in progress up to Kemubu at the 96th mile. The distance between railhead in Kelantan and railhead in Pahang was 78 miles. When this gap is completed, the Federated Malay States will have an alternative route and shorter from Singapore to Bangkok.

The line joins the Siamese Railways at Sungei Golok, and the Siamese line continues to Haad Yai Junction, where the present main Singapore-Bangkok line is picked up.

Other works were carried out at Ipoh (increased railway facilities), Bukit Serayah (water supply), Klang (bridge over Klang River), Kuala Lumpur (doubling and deviation of line), Seremban (increased facilities), Woodlands, Singapore, and an extension of line to H. M. Naval Base (4 miles).

The system of train control which was brought into force on the Federated Malay States Railways in January 1922 has gradually been extended since its inception and last year 15 additional stations were added to the controlled area, making a total of 43 stations now in direct communication with the Controller.

(The dollar is equal to 2s. 4d.).



Ipoh Station Yard

Preliminary Project for Canton Outer Harbor

By G. W. Olivecrona, Engineer-in-Chief of the Board of Conservancy Works of Kwangtung

THE Commissioner of Reconstruction and the Mayor of Canton City have, with dispatches, separately requested the Board of Conservancy Works to instruct their foreign Engineer to compile a detailed report on the construction of a commercial harbor at Whampoa.

The Commissioner and the Mayor having requested that the report be delivered to them in the shortest possible time, the Engineer had not at his option to undertake a detailed new survey. He therefore decided to compile his scheme on the basis old surveys and investigations. Accordingly, the following plan should be considered as being only preliminary, the final one to be prepared after a renewed, comprehensive investigation has been completed.

The construction of an outer, commercial harbor for Canton is an undertaking of far-reaching consequences and should be carefully studied and well planned before being put into execution. In the writer's opinion comparative schemes, as to the best site for the piers, the most economical type of quays and godowns, etc., should be prepared. To compile and study such schemes, would, however, necessitate much more time than the Engineer hitherto has had at his disposition.

It would surely lead to fatal mistakes, irreparable in the future, if a plan of such magnitude, as the one now under consideration, were set down as final, before a careful study of all the technical as well as all the economical suppositions for the success of same had been undertaken.

Preliminary Project for Canton Outer Harbor at Whampoa

The Whampoa Anchorage

Where the front reach debouches into the main branch of the Pearl River a deep basin is formed, stretching from the Western point of Danes Island in front of Whampoa to Flat Island. This basin has a depth of from 9 m. (30 Eng. ft.) to 15 m. (50 Eng. ft.) its deepest part being in front of the Naval and Military Colleges. The width between the 24-ft. contour lines varies from 175 m. (530 Eng. ft.), to 350 m. (1065 Eng. ft.). In the old days this place was used as an anchorage for ocean-going ships, which, could not proceed to Canton. Since Hongkong became a harbor, these ships discharge there or shift their cargo into smaller vessels, suitable for navigation on the upper Pearl River. During Whampoa's "golden days," ships had accommodations with regard to repair and outfitting, as dry docks and work shops were available. With the disappearance of the commercial shipping, these accommodations were used for some time by the Chinese Navy; but in later years they have entirely ceased to function.

The Whampoa Anchorage is well protected against gales, and typhoons do not often pass over the place. During the last 20 years only a few typhoons have struck Whampoa, and these have not caused much damage.

The river bottom consists of sandy clay and affords good anchorage.

The Approach to Whampoa

From Lantou Island to the mouth of the Pearl River at Bocca Tigris, two channels have developed, one to the East following the coast, and the other coinciding with the centre line of the Estuary. The latter one is outside of British territorial waters. Both of these channels have in their upper courses a minimum depth of only 6.1 m. (20 Eng. ft.) at low water of ordinary Spring Tides (L. W. O. S. T.). The centre channel is the narrowest of the two, having a width of only 900 m. (½ naut. mile) in its upper course. At Bocca Tigris, where the two channels join, the depth again increases and measures from 11 to 28 m. (35 to 90-ft.) in the fairway as far as to the Southern end of Pottinger Island, where the Second Bar forms a serious obstacle to navigation. The depth on the Bar is only 5.18 m. (17-ft.) at L.W. O.S.T. After the Bar has been passed ample depth again prevails as far as to the First Bar, where a depth of 6.1 m. (20-ft.) prevails. Having passed this Bar, the Whampoa Anchorage is reached.

The channels below Bocca Tigris, which, on the Admiralty Chart are called Fan Fi Ak channels, and have only 6.1 m. (20-ft.) depth at low water, decide the draft of vessels, which can proceed to Whampoa. To deepen this channel would involve the construction of very extensive training works, the cost of which would mean an expenditure of from 12 to 15 million Mex. dollars. For the present much outlay would not be justified and, therefore the Fan Fi Ak Channels should be left as they are. On the other hand, it is possible to deepen the Second Bar at a reasonable cost, and, therefore, or simultaneously with a harbor construction at Whampoa, the Second Bar should be improved to a depth of 6.3 m. (21-ft.)

Whampao

As a comparison the prevailing depth of the approaches to some harbors is given in the following table :—

Table I.

Port	Available Depth in Approach Channels or at the Port at L.W.O.S.T. feet	Maximum Draught to which vessels may be loaded to enter or leave at H.W.O.N.T. feet
Bangkok (Bar)	4 to 6	11 to 15
Koh-si-chanf (outside Bangkok Bar)	Vessels can load to any draught	
Saigon	23	25½
Haiphong	15¾	24
Honggy	12	20
Canton	7¾ (Tai Mei Barrier 7 to 8 Tai Sheik barrier)	14
Swatow	16	18
Amoy	Vessels can load to any draught	
Foochow	8 to 9	24½
Shanghai	25	28

Draft of Ships

The rise of an ordinary Spring Tide is 7¼ feet below Bocca Tigris, and 6½ feet at Whampoa. Counting 2-ft. of water under the keel, a ship having a draft of 21.5-ft. can safely be piloted into the Whampoa Anchorage at Spring Tides.

The rise of an ordinary Neap Tide is 5-ft. below Bocca Tigris and 4-ft. at Whampoa. Allowing 2-ft. of water under the keel, a ship of 19-ft. draft can for the present enter the anchorage at Neap Tides.

Assuming that the Second Bar is deepened to 6.3 m. (21-ft.) at L.W.O.S.T., the following table gives the approximate number of days in the year when ships of different draft can enter Whampoa Anchorage.

Table II.

Draft of ship	Number of days in the year when ship can enter Whampoa	Rise
7.0 m. (23-ft.)	365 days	5-ft. at Bocca Tigris.
7.3 m. (24-ft.)	325 ,,	6 ,, ,, ,, ,,
7.6 m. (25-ft.)	2,000 ,,	7 ,, ,, ,, ,,
7.7 m. (25¼-ft.)	170 ,,	7¼ ,, ,, ,, ,,

Ships with a draft of more than 7.7 m.(25¼-ft.) may occasionally enter Whampoa at favorable tides ; a draft of 8.2 m. (27-ft.) may, however, be considered to be the greatest for a ship, with safety to be piloted through the shallow channels.

It is recognized that there is no uniform relationship between draft and tonnage and, therefore, no rule can be applied only. The American Shipping Board, from a study of vessels in actual use at the present time, have arrived at the following determination of draft.

Tonnage		
Net *	Gross*	Average draft feet
10,000 and over	15,000 and over	34.1
9,333 to 10,000	14,000 to 14,999	30.8
8,666 ,, 9,333	13,000 ,, 13,999	31.6
8,000 ,, 8,666	12,000 ,, 12,999	29.7
7,333 ,, 8,000	11,000 ,, 11,999	29.4
6,666 ,, 7,333	10,000 ,, 10,999	29.3
6,000 ,, 6,666	9,000 ., 9,999	29.2
5,333 ,, 6,000	8,000 ,, 8,888	28.5
4,666 ,, 5,333	7,000 ,, 7,999	27.5
4,000 ,, 4,666	6,000 ,, 6,999	27.0
3,300 ,, 4,000	5,000 ,, 5,999	25.4
2,666 ,, 3,333	4,000 ,, 4,999	24.3
2,000 ,, 2,666	3,000 ,, 3,999	22.6
1,333 ,, 2,000	2,000 ,, 2,999	20.1
666 ,, 1,333	1,000 ,, 1,999	17.2

*Note:**

" Gross Tonnage " means the cub. contents of the hold of a vessel after deduction of the cub. contents for the accommodation of the crew. " Net Tonnage " on which dues are paid, " registered tonnage," means the cub. contents of the hold after deductions have been made of the space occupied by the crew *and* the machinery used for propelling the ship. The quantity of cargo which a vessel will carry, or her " ton burden " greatly exceeds her registered tonnage. Taking, for instance coal as a cargo, the average quantity steam vessels are capable of carrying for every 105 tons register is as follow :

Wood vessels	182 tons of cargo
Iron ,, ...	197 ,, ,, ,,
Steel ,, ...	216 ,, ,, ,,

The table shows that ships up to 5,000 gross tonnage may be expected to call at Whampoa, if opened as a harbor. It is interesting to note that out of 14,513 steamships, listed in Lloyd's Register for 1918-1919, no less than 81.45 per cent. have drafts of 7.6 m. (25-ft.) or less. Of 30,939 vessels passing through the Suez Canal during the year 1913-1921, only 3.3 per cent. had drafts of 8.2 m. (27-ft.) or more. The average draft was considered to be less than 7.6 m. (25-ft.), and was probably nearer 6.4 m. (21-ft.). Out of 6,241 vessels in use in U. S. A. in 1918, as many as 4,816 or 77 per cent. had a draft of 7.4 m. (24.3-ft.) or less, their gross tonnage varying between 500 and 5,000. Of 1,152 commercial ships passing the Panama Canal from July to December, 1919, the average draft in salt water was 6.4 m. (21-ft.)

Referring to these figures, it seems likely that a great number of the world's commercial steamers in use will be able to proceed fully loaded to Whampoa. A 5,000 ton steamer has an average length of 130 m. (423-ft.) and a breadth of 16 m. (53-ft.).

Depth Alongside Piers

As has already been pointed out, the Whampoa Anchorage has a depth of up to 15 m. (50-ft.), and offers ample berth for the largest ocean going ships. But the figures given above also state the limited depth in the approach to the port, for which reason the splendid roadstead at Whampoa cannot be utilized to its full capacity. To make of Whampoa anything more than a good second class port will, therefore, be out of the question. As such it would, however, of the greatest importance to the trade of Canton, not only by facilitating the distribution and exchange of merchandise throughout the province, but also as an industrial centre for South China, with good lines of communication by sea as well as by land.

The depth alongside quays naturally corresponds to the draft of vessels that enter the port. Table I indicates that vessels of 7.3 m. (24-ft.) draft will be able to enter the port, during 325 days or, practically speaking, the whole year round. To accommodate vessels of this draft requires a depth alongside quays in the Ship Basin of 7.9 m. (26-ft.) at L.W.O.S.T. To go beyond this depth would only unnecessarily increase the cost of quay construction and of dredging. Should a ship of larger draft than 24-ft. succeed in entering the harbor, she would have to ease her draft a few feet before going alongside the quay.

The depth alongside quay in the Junk Basin has been proposed to be 4.6 m. (15-ft.)

Situation of the Harbor and General Arrangement

A harbor must be so situated that good and uninterrupted transport facilities may be maintained with the hinterland as well by water as by land routes. The situation must also afford good protection against wind and sea, whether the ships are moored alongside the quays, or in the roadstead. The roadstead must be of sufficient depth and extent to permit easy navigation for ships moving in and out. When planning for a new harbor, consideration should also be given to the question of future extention. It is advantageous to build the harbor as close as possible to the business centres ; but this is seldom possible, as these centres generally are situated away from the sea shore. It is also advantageous to limit, the functions of the harbor within the smallest possible area, and for that purpose the pocket system is to be preferred to quays extending in a single line along the shore.

In the Pearl River are several good places, where an outer harbor for Canton could be built. An ambitious scheme has already been propounded, namely to construct an outer harbor on the Southern shore of Coloison Reach, with railway connection with Canton. This scheme has many advantages and would give to Canton a magnificent harbor with unlimited possibilities for extention. The great distance from Canton, and the necessity of expensive railway construction, make this scheme less attractive compared with the Whampoa scheme.

Honam

Judging from the present tendency of development, Canton will expand to the East, and the extension of the city seems to follow the Front Reach and the Canton-Kowloon railway. The natural situation of an outer harbor will, therefore, be somewhere along the Front Reach. It would be possible to construct a harbor on the Northern shore of the Front Reach in front of the Yuenchuen and Chingkai villages only 10 km. (5.3 naut, miles) from Canton; but this site would necessitate extensive dredging work, though in other respects the place would be suitable. After careful investigation I have found that it would be both cheaper and more practical to place a future harbor close to the Whampoa Anchorage, although its distance from Canton is greater than the place mentioned above. An exceptionally good situation for wharfs is to be found off the lower end of Junk Island, between this Island and Watson Island. The channel between Junk Island and the main land is, for regulation purpose, proposed to be closed, independently of any harbor construction taking place or not. The proposed embankment, connecting Junk Island with the main land, will make of the Island a peninsula with an extensive waterfront, ideal as a place for anchorage and industrial establishments. Besides, a harbor at this place will well fit in with the work, which are proposed in connection with a regulation of the Front Reach.

By including Watson Island in the future harbor area, ample space with waterfront will be available for the establishing of a free port. The proposed site is close to the old Whampoa establishment with its old docks and accommodations for repairs which should again be put into order. The Whampoa Island, with deep water close to the shore, is especially suitable as a site for dock yard and repair ships, both of which are necessary implements to a modern harbor. In the future, the island should also be maintained as a centre for this industry. The site now proposed for the piers covers a big shoal of an average depth of only 1.2 to 3.0 m. (4 to 10-ft.), and does not intrude upon the already existing anchorage.

Piers

The situation of the piers is shown on PI and II. From the South end of Junk Island, 3 piers are laid out, partly built on the island and partly in the shallow water off the island. Between Junk and Watson Islands 2 more piers are placed, entirely built in the water, all of them ending at the deep basin in front of Whampoa.

The five piers are each 55 m. (168-ft.) wide, but vary in length. The quay walls are made of concrete, resting on wooden pile rafts. The space between the walls is filled in with mud, excavated from the basins. Ware houses are built in the centre, with railway tracks laid out on each side. Portable vreaes of modern type will serve each ship berthed.

The depth in the ship basin will be 7.9 m. (26-ft.) and in the junk basin 4.6 m. (15-ft.)

A transversal section over three piers in shown on PI II.

In all 3,215 m. (10,540 ft.) of effective quays with a depth alongside of 7.9 m. (26-ft.), and 2,815 m. (9,230-ft.) with a depth of 4.6 m. (15-ft.) will be provided for, giving berthing place to 16 steamers of 4,000 to 5,000 gross tons.

Ware Houses

On the piers are constructed all together 14 three storied ware houses, 13 having a length of 150 m. (492-ft.) and a width of 35 m. (115-ft.), and 1 of the same width but only 125 m. (328-ft.) long. They are constructed in reinforced concrete on wooden pile foundation, with modern appliances for handling the cargo inside the ware house.

The bottom floor serves as a transit shed where the goods are examined and divided.

Handling of Goods

The handling of the goods is carried out in the following way:

The incoming ocean steamer moors on one side of the pier and discharges her goods into the transit shed, where examination and classification take place. Goods intended for transportation on rail may be loaded direct on to cars.

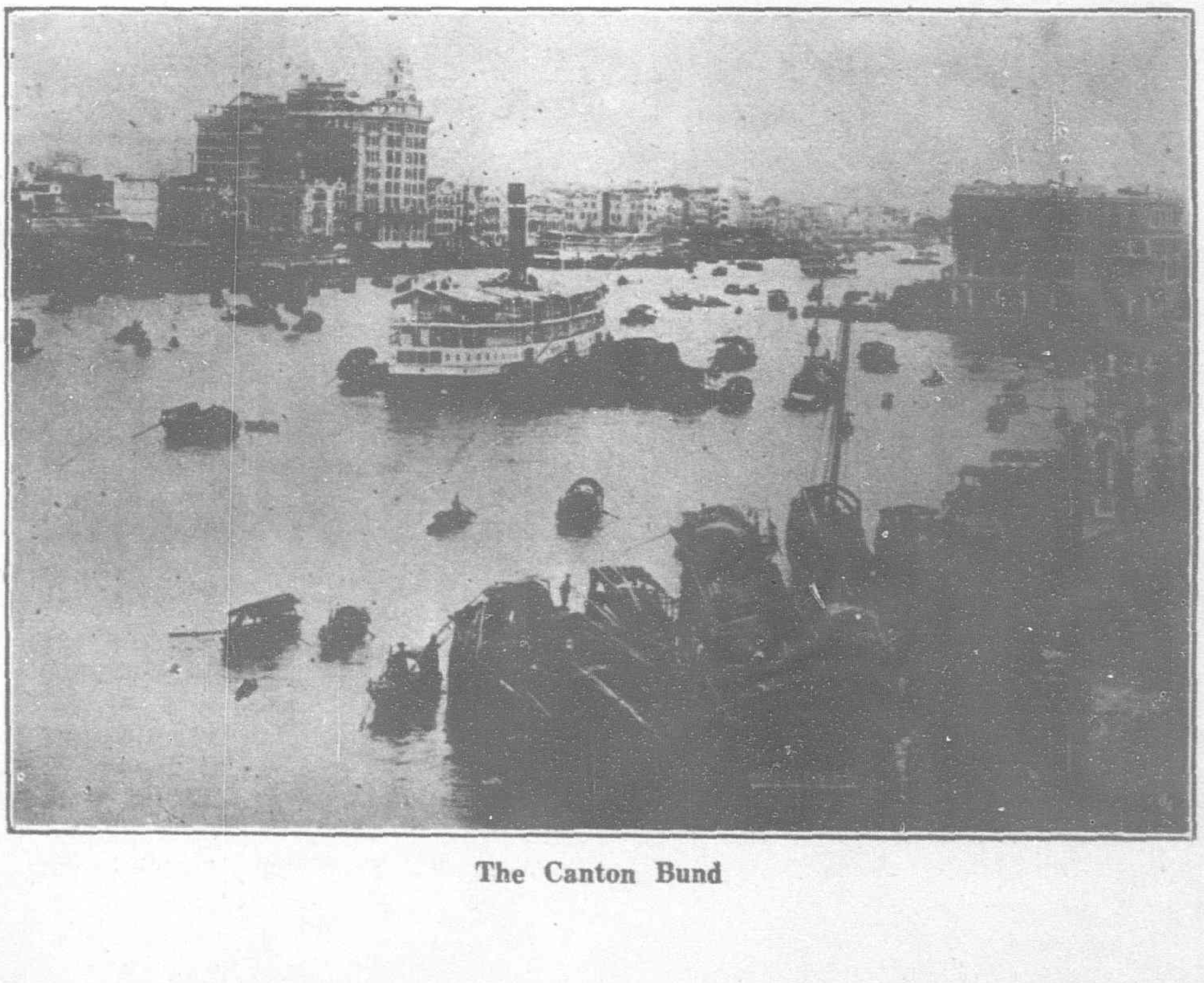
After having passed the examination, etc., the goods are transported to the other side of the pier and loaded directly into river craft or railway cars and sent off. The goods intended for long storage are placed on the upper stories of the ware house, where they may be assorted and repacked before distribution.

Goods, intended for export, arrive either by river craft or by rail, and are dealt with in the reverse way.

Thanks to an ample number of cranes, the moving of goods will take place with great rapidity, and the delay of ships reduced to a minimum.

Staff Accommodation, Electric Power Station

A special area in set apart for houses to accommodate quarters for offices and staff.



The Canton Bund

An electric power station is proposed to be built within the harbour to supply light, and power for cranes and other transport facilities.

Industrial Harbor

Besides the mercantile harbor above described, the scheme provides for an industrial harbour with extensive waterfront and good sites for industrial establishments. This harbor is formed by the closed up channel running between the Junk Island and the main land. Access to the harbor is given through the channel between Watson Island and the main land, the Yuechue channel, and also through a movable bridge in the embankment at the upper end of the harbor. The Yuechue channel will be 120 m. (395-ft.) wide and can easily be dredged to a depth of 6.1 m. (20-ft.), which will allow ships of 5.5 m. (18-ft.) to moor alongside the quay. Watson Island should be used in the future as a site for warehouses, shops and factories in case a part of the harbor should be utilized as a free port. (A "free Port" means a harbor, in which imported or exported goods may be stored for longer or shorter time without being subject to any customs duty. The duty is paid only when the goods leave the harbor. Within such a harbor, conversion of raw materials into finished products also takes place; hence the need of space for factories.).

Communication

The harbor will have railway connection with the Canton-Kowloon Railway by means of a 5,500 m. (10 on li.) long, single track railway line, joining the present railway at the Chapei station. Parallel with the railway runs a motor road of 7.5 m. (25-ft.) width, joining the Chungshan road, now under construction. The distance by rail between the harbor and Taishatau railway station in Canton will be 18 km. (32 Chi. li), and by motor road 17.5 km. (32.5 Chi. li) and can be travelled by a motor boat in about one hour's time. When the Front Reach has been trained—an improvement which cannot be left undone if Canton is to fill its place as a centre for the South China Trade—the tide will run more regularly than now, and enable junks and lighters to move easily and cheaply between the city and the harbor.

A harbor at Whampoa, in order to serve its purpose as the great trade mart of southern China, presumes the linking up of the Canton-Kowloon and the Yueh-Nan Railway, and also the extension of the latter further inland. It may be expected that Whampoa, if made into a modern port, will serve as shipping centre for trade to and from Kwangtung, Kwangsi, and the southern half of Hunan and Kiangsi, naturally under the assumption that the prospected railway communications through these provinces will be established. It is, therefore, prudent to plan for a considerable shipping from the beginning. The plan here discussed, will accommodate berthing place along quays simultaneously for at least 16 ocean going steamers of 5,000 tons capacity. When more berthing place is needed, new piers can be constructed along the Northern shore, opposite the Flat Island, where deep water is found close to the shore.

Estimate of Costs

The figures given below are approximate, based on old surveys and soundings with regard to dredging and training works. The completion of the harbor work is divided into three Stages of Developments, the first Stage intended to meet the immediate needs.

First Stage of Development

(a) *Improvement of the Approaches.*	
Dredging of the First and Second Bars to 21-ft. below L.W.O.S.T., building of training walls and cribs	H. K. $ 900,000
(b) *Harbour Works.*	
Piers Nos. 1 and 2; quay wall in front of "Open Storage;" dredging of adjacent Basins and in front of "Open Storage" ..	H. K. $2,900,000
There Ware Houses, 34 by 150 m. (110 by 450-ft.) 3 story, bottom floor serving as Transit Sheds; Administration House;	
Appartenant terminal works, such as railway tracks within the harbor, roadways, paving, cranes and other mechanical equipment, electric plant, purchase of land on Junk Island, etc.	H. K. $1,100,000
(c) *Railway and Road Connection,* with the Canton-Kowloon Railway and the Chungshan Road; bridges and houses	H. K. $ 300,000
Total	H. K. $5,200,000

Effective Wharfs, 26-ft depth alongside	985 l. m.	(3,230-ft.)
Effective Wharfs, 15-ft. depth alongside	600 ,,	(1,968-ft.)
Storage capacity of Ware Houses ..	20,260 sq. m.	(218,000 sq. ft.)
,, ,, ,, Transit Shed	10,000 ,, ,,	(107,600 sq. ft.)
Open Storage	36,200 ,, ,,	(389,510 sq. ft.)

Time for completion three years.

Second Stage of Development

(a) *Harbor Work.*	
Piers No. 3 dredging of adjacent Basin	H. K. $2,100,000
Three Ware Houses, 34 by 150 m. (110-ft. by 456-ft.), 3 story; administration house;	
Appartenant terminal works, such as railway tracks, roadways, paving, cranes and other mechanical equipment, etc.	H. K. $1,000,000
(b) *Railway: Terminus;*	
Station building and tracks	H. K. $ 200,000
Total	H. K. $3,300,000

Effective Wharfs, 26-ft. depth alongside	650 l. m.	(2,130-ft.)
Effective Wharfs, 16-ft. depth alongside	630 ,,	(2,065-ft.)
Storage capacity of Ware Houses ..	20,260 sq. m.	(218,000 sq. ft.)
,, ,, ,, Transit Shed ..	10,000 ,, ,,	(107,600 sq. ft.)

Time for completion two years.

Third Stage of Development

(a) *Harbor Work.*	
Piers Nos. 4 and 5; dredging of adjacent Basins, earth fill, bridges	H. K. $5,700,000
Seven Ware Houses 34 by 150 m. (110-ft. by 456-ft.) and one 34 by 125 m. (110-ft. by 410-ft.) 3 story; administration house;	
Appartenant terminal works as before under first and second Stages, purchase of land on Walton Island, etc.	H. K. $2,100,000
(b) *Railway Extension.*	
Railway yards with equipment on Junk Island	H. K. $ 150,000
Total	H. K. $7,950,000

Effective Wharfs, 26-ft. depth alongside	1,680 l. m.	(5,180-ft.)
Effective Wharfs, 15-ft. depth alongside	1,585 ,,	(5,197-ft.)
Storage capacity of Ware Houses ..	52,730 sq. m.	(567,370 sq. ft.)
,, ,, ,, Transit Sheds ..	23,000 ,, ,,	(247,480 sq. ft.)

Time for completion four years.

Summary

First Stage of Development, cost	H. K. $5,200,000
Second ,, ,, ,, ,, ...	,, 3,000,000
Third ,, ,, ,, ,, ...	,, 7,950,000
Total Cost	H.K. $16,450,000

Total length of Effective Wharfs, 26-ft. depth alongside ..	3,215 m.	(10,540-ft.)
Total length of Effective Wharfs 15-ft. depth alongside ..	2,815 m.	(9,230-ft.)
Storage capacity of Ware Houses	93,250 sq. m.	(1,003,370 sq. ft.)
,, ,, ,, Transit Sheds	43,000 ,, ,,	(462,680 sq. ft.)
Open storage	36,200 ,, ,,	(389,510 sq. ft.)

As a precaution against undue rise in land value it would be advisable to conclude, at an early stage, with the owners of land on Junk and Watson islands binding contracts as to the purchase of their property.

Heavy-Duty Goods Locomotives

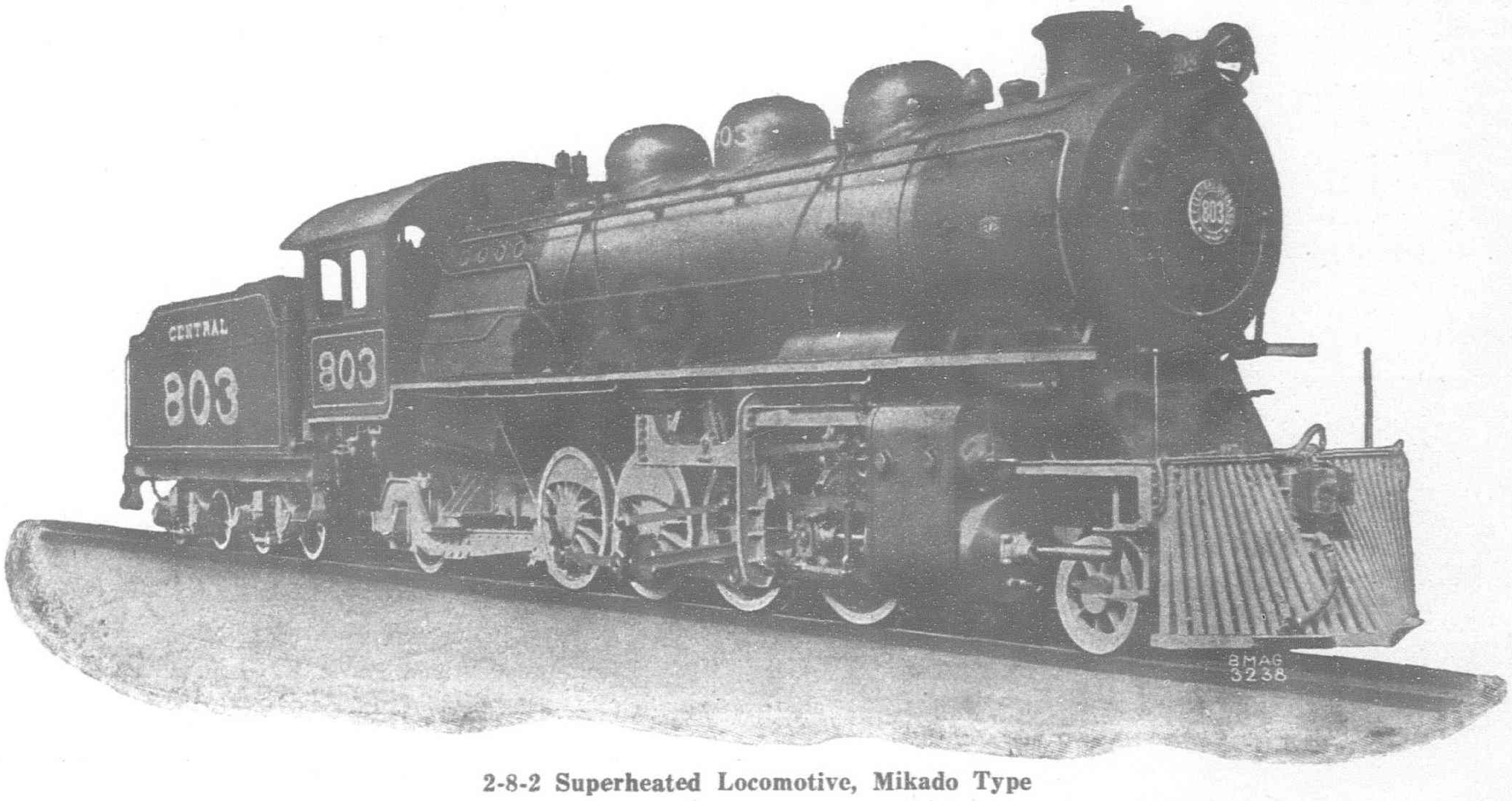
Built by the Berliner Maschinenbau-Actien-Gesellschaft vormals L. Schwartzkopff, Berlin.

THE piloting of heavy trains being so uneconomical leads modern locomotive designers to endeavour to build very heavy locomotives with many wheels which shall develop the maximum power under the given conditions of load per wheel and which obviously shall be equipped with all modern devices for efficient operation.

These considerations have led the Railway Administrations in the United States and other countries to adopt locomotives of extraordinarily large size.

The renowned firm, the "Berliner Maschinenbau-Actien-Gesellschaft vormals L. Schwartzkopff, Berlin, Germany," has recently delivered some heavy goods-locomotives which combine simple and good-looking design with very high power and are therefore interesting specimens of German locomotive engineering. A short description of these locomotives follows :—

I) 2-8-2 *Superheated Locomotive,* "*Mikado*" *type*, with eight-wheeled tender, gauge 5-ft. 3-in., for the Estrada de Ferro Central do Brazil.



2-8-2 Superheated Locomotive, Mikado Type

South American, and particularly, Brazilian Railway Companies generally prefer the metre gauge, but some Companies, and among them the Estrada de Ferro Central, have adopted the 5-ft. 3-in. gauge.

In 1925, the Berliner Maschinenbau-Actien-Gesellschaft vormals L. Schwartzkopff received an order from the Estrada de Ferro Central for several modern "Mikado" locomotives. The appearance of the locomotives was to be similar to the Company's American locomotives, but nevertheless all the advantages of modern locomotive engineering were included in the construction of the locomotives.

The principal data of this type are as follows :

Locomotive :

Gauge :	5-ft. 3-in.
Cylinder diameter	22⅞-in.
Piston stroke	28-in.
Driving wheel diameter	53-ft.
Fixed wheelbase	14-ft. 6¼-in.
Total wheelbase	32-ft. 11¼-in.
Boiler pressure, gauge	190-lb. sq. in.
Heating surfaces—	
Fire box	209.4 sq. ft.
Tubes	2367.0 ,,
Boiler	2576.4 ,,
Superheater	755.6 ,,
Total	3332.0 ,,
Grate area	66.7 ,,
Weight, empty	206,200 lb.
in working order	225,600 ,,
dahesion	162,800 ,,
Maximum tractive effort (.85 p.)	44,400 ,,
Tender :	
Wheel diameter	33-in.
Truck wheelbase	5-ft. 5-in.
Total wheelbase	15-ft. 9-in.
Water capacity	3,740 i-gal.
Bunker capacity	18,740-lb.
Weight, empty	48,700 ,,
in working order	104,900 ,,

DESCRIPTION

The smallest curve radius on the line is 460-ft. and, owing to the long wheelbase of 32-ft. 11¼-in., flexibility was an important point. The fixed wheelbase of the eight coupled wheels is 14-ft. 6¼-in. and the tires of the four inner wheels are without flanges. The leading Bissel truck is free to swing for 3⅛-in. to either side and the trailing wheels have lateral play of 4.3/16-in.

The Brazil coal is long-flamed, contains up to 30 per cent. of uncombustible matter and a high percentage of slate. Many researches were made in Brazil for burning such coal under economical conditions, and finally led to a standardization of boilers. Under these standards, the grate area was increased to 66.7 sq. ft. which is the limit of one-man handling. Those stay bolts that have been found liable to fail were equipped with spherical heads. The flues—of mild steel—are welded into the fire box tube plate.

Because of the broad gauge, a capacious ash tray could be provided and equipped with air dampers of suitable size. On account of the high percentage of uncombustible matter in the coal the grate is of the shaking type and operated by steam. The fire door which has two flaps is operated by a pneumatic device which the fireman controls with his foot.

Like all modern locomotives, this type is equipped with a superheater (Schmidt system) and a feed water heater (Knorr system).

The frame is of the usual bar type having two side plates 4⅜-in. thick and is very rugged on account of the liberal weight limits allowed.

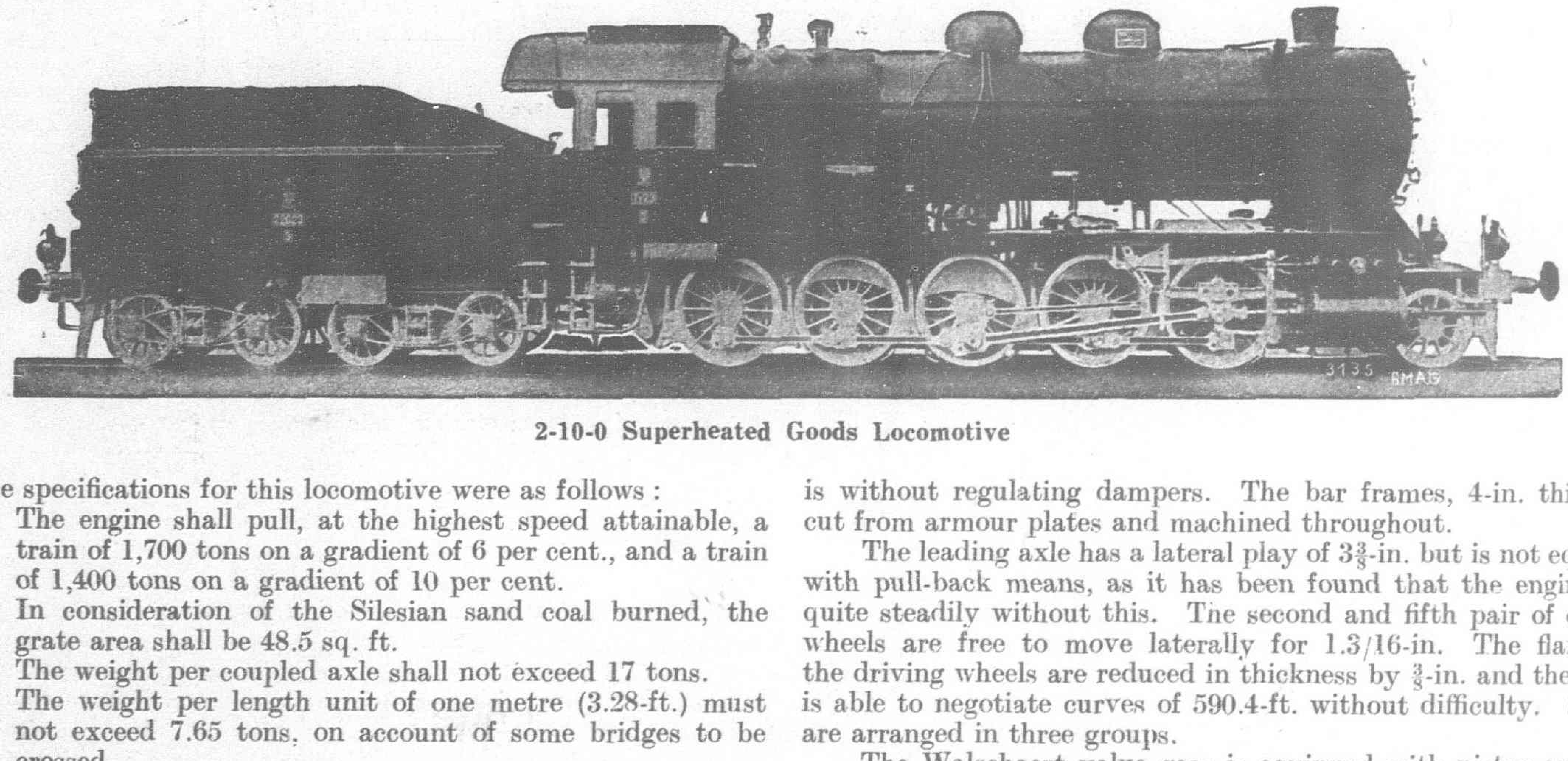
The leading wheels are in a Bissel truck and the trailing wheels are in a radius-bar truck. Equalizing levers connect the six leading and the six trailing wheels. A central buffer coupling and a cow catcher of wood are arranged at the front transverse beam.

The slide valves, of the piston type, are actuated by a Walschaert valve gear with a steam-actuated reversing apparatus, and a sight lubricator is arranged at the rear wall of the boiler for lubricating the pistons and piston valves. Each cylinder is equipped with an automatic pressure-equalizer, an air inlet valve, and two safety valves.

The equipment comprises: A Westinghouse air brake, a steam brake for the locomotive, two sand boxes with steam sanding gear, a compressed air bell, electric lighting of the " Pyle National Co.", thermo-electric pyrometers for the valve chests. The boiler and the cylinders are lagged with magnesia plates and bright steel plate.

The trial trips on arrival at the destination of the locomotives have shown that their proportions were thoroughly well calculated and that their operation is very satisfactory in every respect, and very economical. The trial trips were made on the mountain line from Belem to Barra de Piraly, with the usual express train of 312 metric tons attached to the locomotive. The long gradient of 18 per mille was negotiated at an average speed of 24.8 miles per hour. The steaming was excellent, a pressure of 178 to 188-lb. per sq. in. being maintained, and the steam temperature was 350 to 370 centigrade.

II. 2-10-0 *Superheated goods locomotive, " Decapod " type,* with eight-wheeled tender, standard gauge, for the Polish State Railways.



2-10-0 Superheated Goods Locomotive

The specifications for this locomotive were as follows :

1. The engine shall pull, at the highest speed attainable, a train of 1,700 tons on a gradient of 6 per cent., and a train of 1,400 tons on a gradient of 10 per cent.
2. In consideration of the Silesian sand coal burned, the grate area shall be 48.5 sq. ft.
3. The weight per coupled axle shall not exceed 17 tons.
4. The weight per length unit of one metre (3.28-ft.) must not exceed 7.65 tons, on account of some bridges to be crossed.
5. On account of the low inflammation point of the Galician lubricating oil, the temperature of the steam must not exceed 350 centigrade.
6. The capacity of the tender shall be of 4,730 gallons of water and 10 tons of coal.

On account of the special conditions on the lines for which the locomotives are designed, the diameter of the cylinders was made so large as to enable the locomotives to pull a train of 1,700 tons at 50 to 55 per cent. admission, on a gradient of 6.6 per cent., and with 20 to 25 per cent. admission on the remainder of the line, this being an economic utilization of the steam.

In order to obtain maximum tractive effort, the piston stroke was made 28⅜-in. The cylinder diameter of 25⅝-in. is small as compared with this stroke and therefore the maximum piston thrust is only 100600-lb. so that heating of the crank pins—which are of ample dimensions—in the brasses is eliminated.

The principal data of the locomotive and tender are as follows :

Locomotive :	
Gauge :	4-ft. 8½-in.
Cylinder diameter	25⅝-in.
Piston stroke	28⅜-in.
Driving wheel diameter	57.1/16-in.
Fixed wheelbase	15-ft. 9-in.
Total wheelbase	29-ft. 8⅜-in.
Boiler pressure, gauge..	199-lb. sq. in.
Heating surfaces—	
Fire box	177.7 sq. ft.
Tubes	2232.4 ,,
Boiler	2410.1 ,,
Superheater	791.1 ,,
Total	3201.2 ,,
Grate area..	48.5 ,,
Weight, empty	189,700-lb.
in working order	210,600 ,,
adhesion	187,400 ,,
Maximum tractive effort (.75 p.) ..	48,580 ,,
Tender :	
Wheel diameter	39⅜-in.
Truck wheel base	5-ft. 7-in.
Total wheelbase	15-ft. 7-in.
Water capacity	4,730 i- gall.
Bunker capacity	22,050-lb.
Weight empty	48,500 ,,
working order	117,900 ,,

The rear wall of the Belpaire fire box is inclined and the fire box projects laterally beyond the wheels. The grate is 9-ft. 2¼-in. long and 5-ft. 5¾-in. wide. The Schmidt smoke tube superheater is without regulating dampers. The bar frames, 4-in. thick, are cut from armour plates and machined throughout.

The leading axle has a lateral play of 3⅜-in. but is not equipped with pull-back means, as it has been found that the engines run quite steadily without this. The second and fifth pair of coupled wheels are free to move laterally for 1.3/16-in. The flanges of the driving wheels are reduced in thickness by ⅜-in. and the engine is able to negotiate curves of 590.4-ft. without difficulty. Springs are arranged in three groups.

The Walschaert valve gear is equipped with piston valves of 9⅞-in. diameter with single admission. A circulating valve is arranged on top of the valve chest and an air inlet valve is arranged laterally.

The equipment of the locomotive comprises :

1. A Friedmann restarting injector, Type R. T. No. 11, delivery 55 gallons, on the right,
2. A Knorr feed pump of equal delivery at the left,
3. A Knorr feed water heater, heating surface 144 sq. ft.,
4. Two pop safety valves, 3½-in.,
5. A Zara regulator,
6. A Friedmann lubricating pump, Type ES 10/14,
7. A Westinghouse brake acting on all the coupled wheels,
8. A device, Lopuszynski system, for cooling the superheater tubes with steam from the boiler when the regulator is closed,

9. Knorr compressed air sanding gear acting on the first and fourth pair of coupled wheels, and a hand sanding gear for both sides of the driving wheels.

The tender tank, capacity 4.730 gallons of water and 10 tons of coal, has long lateral filling holes, Austrian pattern. A long pipe, diameter, $5\frac{5}{8}$-in., is provided for the reception of hot fire irons.

The first locomotive of this type was tried on the line from Grunewald near Berlin to Sangerhausen in the presence of two Polish delegates and fired with Silesian coal, heat value 67, 53 calories. The steam temperature was 350 centigrade so that specification No. 5 was completely fulfilled.

The tractive efforts obtained at various speeds and degrees of admission indicate that the locomotive is able to pull trains of 1,700 tons on a gradient of 6 per cent. at a speed of 18.6 miles per hour at 52 to 55 per cent. admission, and trains of 1,400 tons on a gradient of 10 per cent. at 60 to 65 per cent. admission at 14.3 miles per hour, the output being 1,830 and 1,680 h.p., respectively. The maximum output during these trials was 2,020 h.p. at 52 per cent. admission, 38,600-lb. tractive effort, and 18.6 to 20.5 miles per hour.

Further trials in Poland on the line from Lazy to Warsaw have demonstrated that these locomotives are able to pull 2,400 tons on gradients up to 5.5 per cent., and 3,400 tons on the level, at 31 miles per hour.

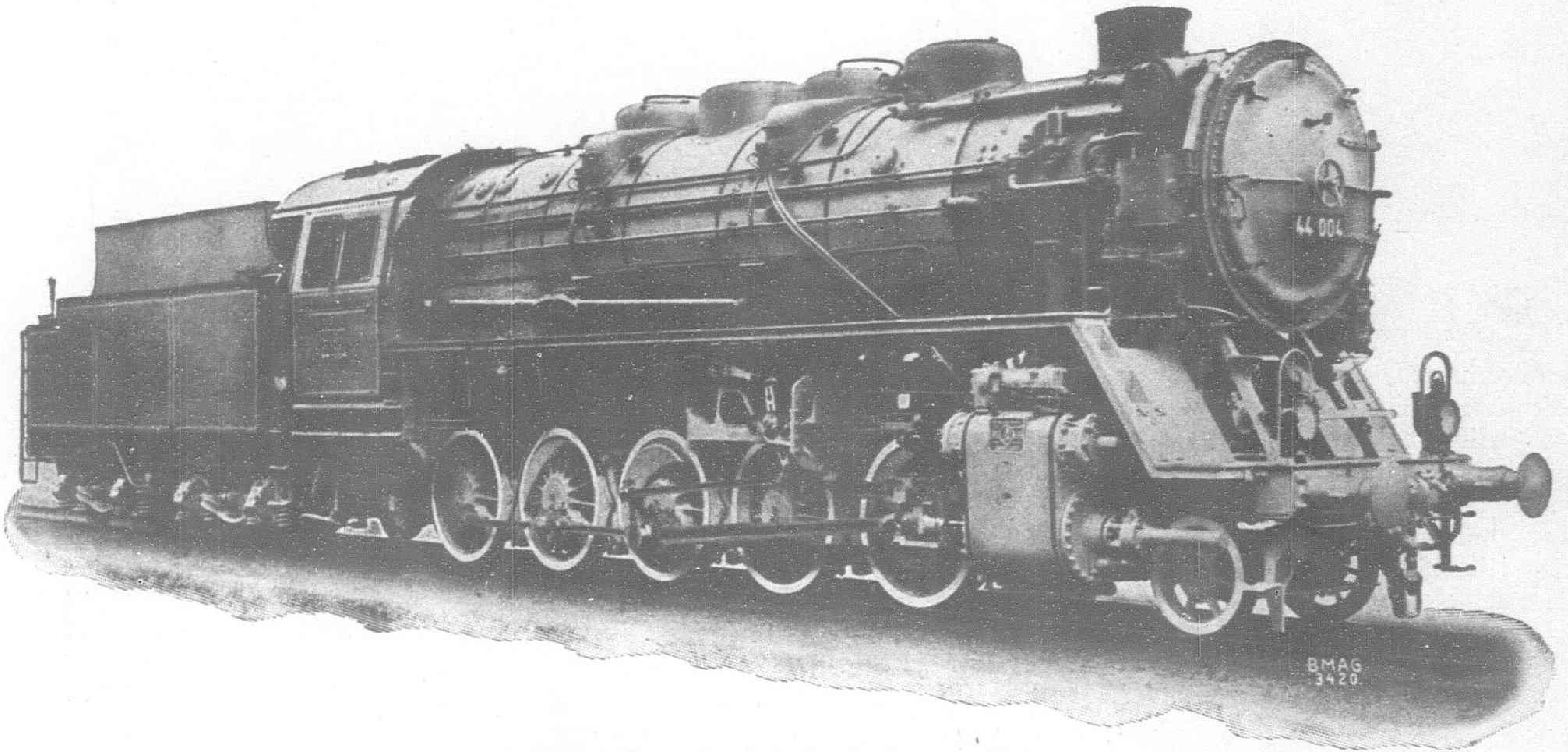
Another modern heavy goods engine which was delivered by the above-named Berlin Co. recently is the

III. 2-10-0 *Superheated goods locomotive*, "*Decapod*" *type*, standard gauge, eight-wheeled tender, for the German Imperial Railways.

The very high tractive effort from the adhesion weight causes correspondingly high piston thrusts and therefore the locomotive has been equipped with three cylinders.

The principal data are as follows :

Locomotive :	
Cylinder diameter	$23\frac{5}{8}$-in.
Piston stroke	26-in.
Driving wheel diameter	$55\frac{1}{8}$-in.
Fixed wheel base	11-ft. $1\frac{7}{8}$-in.
Total wheel base	31-ft. 8-in.
Boiler pressure, gauge..	199-lb. sq. in.
Heating surfaces--	
Fire box	193.7 sq. ft.
Tubes	2357.3 ,,
Boiler	2551.0 ,,
Superheater	1076.4 ,,
Total	3627.4 ,,
Grate area..	50.4 ,,
Weight, empty, ...	226,200-lb.
working order	250,300 ,,
adhesion	218,500 ,,
Maximum tractive effort (.75 p.) ..	59,100 ,,
Tender :	
Wheel diameter	3.15/16-in.
Truck wheel base	6-ft. $2\frac{3}{4}$-in.
Total wheel base	18-ft. $8\frac{1}{2}$-in.
Water capacity	7,040 i.- gall.
Coal capacity	22,050-lb.
Weight, empty	72,700 ,,
in working order	165,400 ,,



2-10-0 Superheated Goods Locomotive

This interesting locomotive is among the "Einheits" (Standard) types which the German State Railways have designed in co-operation with the Locomotive Works with the object of simplifying their rolling stock. A particular feature of this locomotive is the high weight per axle, viz. 20 tons.

It is obvious that these locomotives are equipped with the most up-to-date and approved devices for economical operation. At present, the locomotive is on trial and we hope to be able to publish some interesting data of the results obtained and a detailed description.

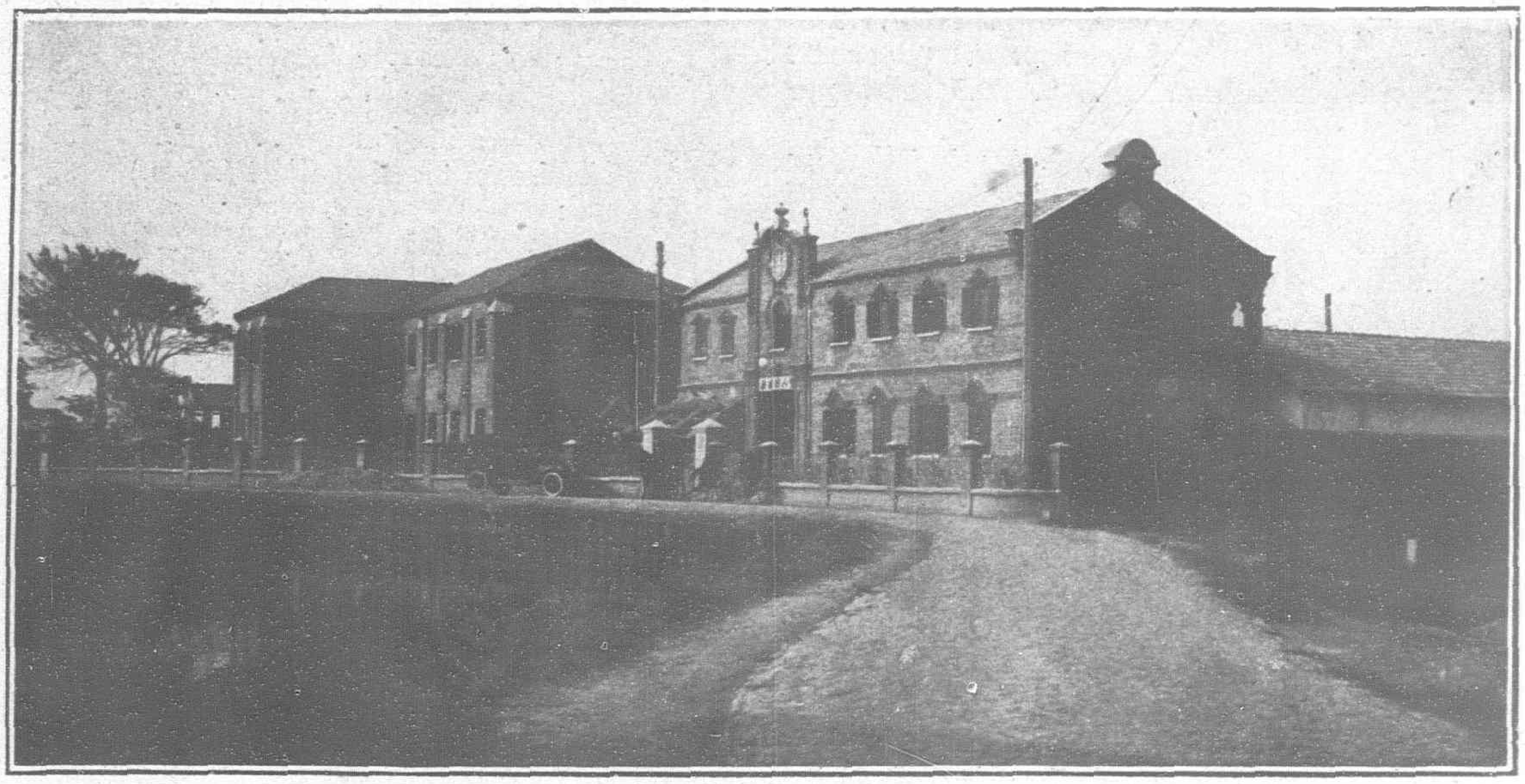
New Type of Locomotive

THE arrival of the first consignment of the new type of locomotive which Armstrong, Whitworth's have constructed for the South Australian Government is being watched with great interest by railway men from all parts of the world. The mountain type, designed to overcome special difficulties of haulage in South Australia, is the largest locomotive built in Britain. It weights 219 tons and has a wheel base of 73-ft. 11-in. These and other locomotives were transported in a new type of motor ship specially built for this purpose. The mountain type of locomotive, in conjunction with the large capacity of the trucks which the Government have ordered in the United States, will revolutionise railway transport in South Australia.

It is important that British manufacturers of railway material should watch closely these and similar developments. They may be entirely unsuitable to the British railway systems, but this should not debar British firms from adapting their designs to meet the special needs of this country, whose great distances and unique transport problems demand special treatment. If the new locomotive achieves the anticipated success, the great British firm has made an important contribution to the development work of the Commonwealth.

Glass Factories in Shanghai

APART from the Paoshan Glass Factory, which is operated with Japanese capital of $500,000 and Chinese laborers numbering 150, there are a number of glass factories in Shanghai operated entirely by Chinese. Among these, the E Chang Glass Co. is on the largest scale, capitalised at $150,000. Next comes the Kung Yi Glass Bottle Mfg. Co., the Chung Kwa Feng Kee Glass Factory, and the Shanghai Glass Co., the first capitalised at $100,000, and the last two, each at $50,000. Factory hands employed in one of these four Chinese companies number between 200 and 250. Another Chinese company, the Tung Yi is operated with $20,000. Besides, there are a dozen more, operating on a somewhat smaller scale. The output of all Chinese plants is confined to bottle glass and ordinary glassware. For expensive plate glass, window glass, and chemical apparatus Shanghai and China in general depend upon imports from foreign countries, principally Japan, Belgium, Britain, and America. The bottles turned out in the Chinese glass factories are consumed chiefly in dispensaries, perfumery companies, confectionery companies, wine companies, and department stores. The leading factories have made contracts with the Hsiang Ya Co., the Sincere & Co., the Yung An Co., the International Dispensary, the Anglo-Chinese Dispensary, other dispensaries, and confectionery companies for the regular supply of their bottle output. The following is a list of the more important Chinese glass factories in Shanghai with addresses :



The Paoshan Glass Works

E Chang Glass Co.	Hukiamukiao, Chapei
Kung Yi Glass Bottle Mfg. Co. ...	Hweiwenloo, Chapei
Shanghai Glass Factory	64 Tientunganloo, Chapei
Chung Hwa Feng Kee Glass Factory	217 Paohsingloo, Chapei
Tung Yi Glass Factory	Tientungloo, Chapei
Chien Yi Glass Factory	387 Chunghsingloo, Chapei
Chinese Merchants' Ta Cheng Glass Mfg., Co.	Hanchung Road, Chapei
Jen Chang Yung Glassware Factory	Chinanfang, Chiuchiaochang, Sinpehmen
Hwa Hsing Glass Factory ...	Tatungloo, Chapei
Ming Cheng Glass Factory ...	
Wang Chun Kee	20 Hsinchangli, Sinkiang Road, Chapei
Wu Hsing Glass Mfg., Co. ...	Kweichinli, Mingtehloo, Chapei
Pootung First Glass Factory ...	Yangkingchen, Pootung

The materials used in manufacture are chiefly broken glass, very little sand being used. Sand is supplied from Ningpo, Dairen, Kwangtung province, and Japan. According to the reports of Chinese manufacturers, which, however, may not be reliable, some 500 tons of sand are imported into Shanghai from Ningpo, 200 tons respectively from Dairen and Kwangtung province, and 100 tons from Japan, every month. Prices are as follows: Ningpo sand, $4.50-$5.00 a ton ; Kwangtung sand, $20-$25 a ton ; Dairen sand, $1.90 per 100 catties ; Japanese sand, $2.50 per 100 catties. Ningpo sand is reddish yellow. It is most popular on account of its cheapness. Kwangtung sand is white and of excellent quality. It is suitable for making glass bulbs. Japanese sand is highly expensive, and least in demand. Dairen and Japanese sand are similar in color, both being grayish-white, and in quality ; but the former is cheaper, and therefore more popular.

The wages of workmen in the Paoshan Glass Factory are as follows : First class workmen, $1.50 a day ; second class workmen, $1.00 a day ; third class workmen, $0.70 a day ; coolies $0.50 a day ; apprentices, $0.30 a day ; boy labor, $1.00 a month, with free board.

A. E. Hitchner Promoted by Westinghouse Co.

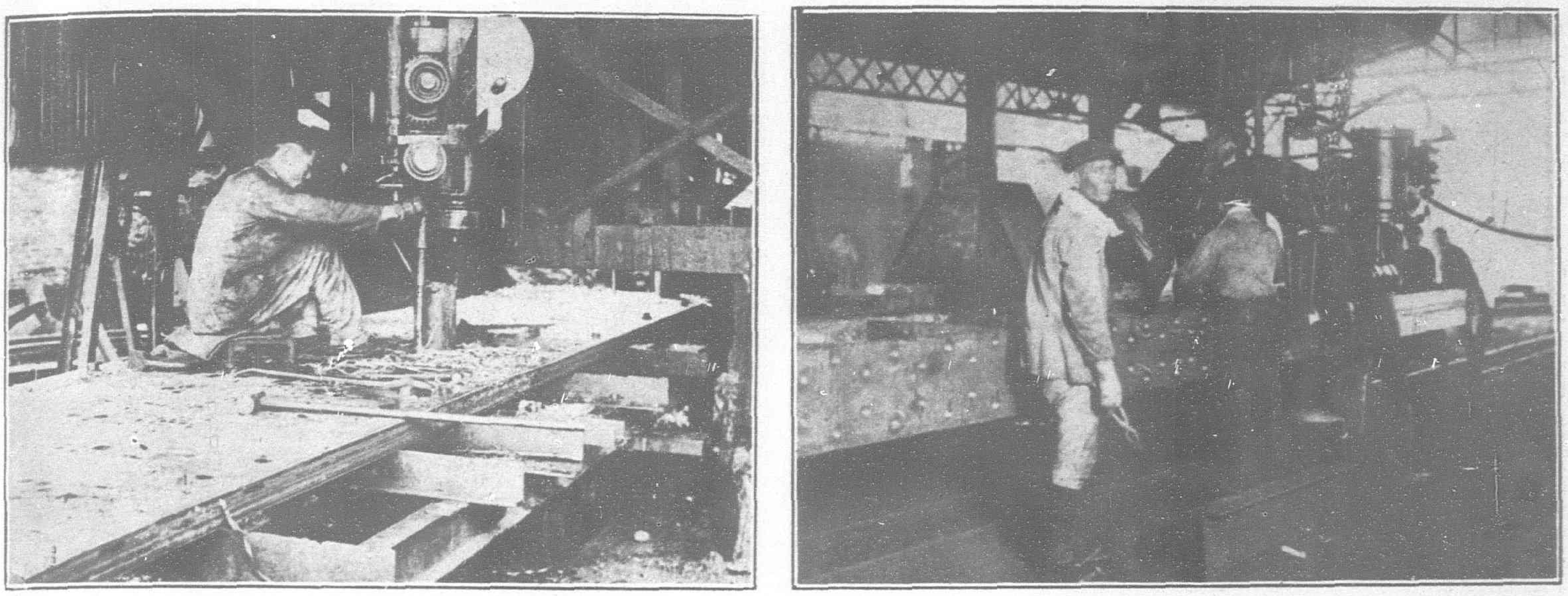
A. E. Hitchner, an executive of the East Pittsburgh headquarters of the Westinghouse Electric and Manufacturing Company has been promoted to the managership of the company's Los Angeles office, the post having been made vacant by the resignation of K. E. Van Kuran.

Mr. Hitchner is a native of New Jersey and spent his early years on the Atlantic Coast.

After obtaining his degree in electrical engineering from Rutgers in 1904, he entered the apprentice course for college graduates at the Baldwin Locomotive Works in Philadelphia, remaining there two years. He left there to join the Link Belt Company, also located in Philadelphia, and for two years was active in construction work of the Company. His next work was operating the Kaolin Mine located in Florida. After a year of mining operations he joined the Westinghouse Company, 1909, and was assigned to general industrial sales work, in the Philadelphia office.

In 1912, he was placed in charge of anthracite mining sales projects of the company, this work carrying him to the Northeastern section of Pennsylvania. Later he established the Wilkesbarre, Pa., sub-office of the company.

In 1919 he was transferred to the East Pittsburgh, Pa., headquarters of the Westinghouse Company, as assistant to manager of the Industrial Department, his work having to do specifically with mining and oil industries. He remained in this position until this latest promotion. He is a member of the University Club of Pittsburgh, Pa., and of the Zeta Psi Club of New York City.



The Plate Girder being Manufactured at the Workshop of the Yokogawa Bridge Company, Ltd.

The Construction of the Yodo-gawa Ohashi

By Eisaburo Kusano

SPENDING well over 2,000,000 yen, the Osaka Prefectural Government is now building the Yodo-gawa Ohashi or the Great Bridge of the River Yodo, which is one of the best bridges ever constructed in connection with the state road building in Japan; the construction of this bridge is the feature of the Osaka-Kobe state road building work, which has been going on for the past several years to be completed some time toward the end of this year.

The port cities of Osaka and Kobe are developing year by year; between the two cities are several growing industrial and commercial cities, such as Mikage, Nishinomiya, and Amagasaki. And, the economic and organic relations of Osaka and Kobe are becoming fast closer, so much so that it is confidently believed that the cities of Osaka and Kobe may be amalgamated into one great city in the near future.

Osaka and Kobe are connected by a modern communications systems by land and sea; the harbor equipment, the railways and electric tramways connecting the two cities are highly developed. But alas! there has hitherto existed no adequate road running between the two cities.

"It is most regrettable that there is no decent road between Osaka and Kobe where there are many growing cities and towns and the population is dense."—this was the motive which caused Messrs. Seino and Hayashi, Governors of Hyogo and Osaka Prefectures respectively, plan the construction of an up-to-date state road between the two cities, and apply for the license to build such road. It was a good many years ago; five governors have been changed since.

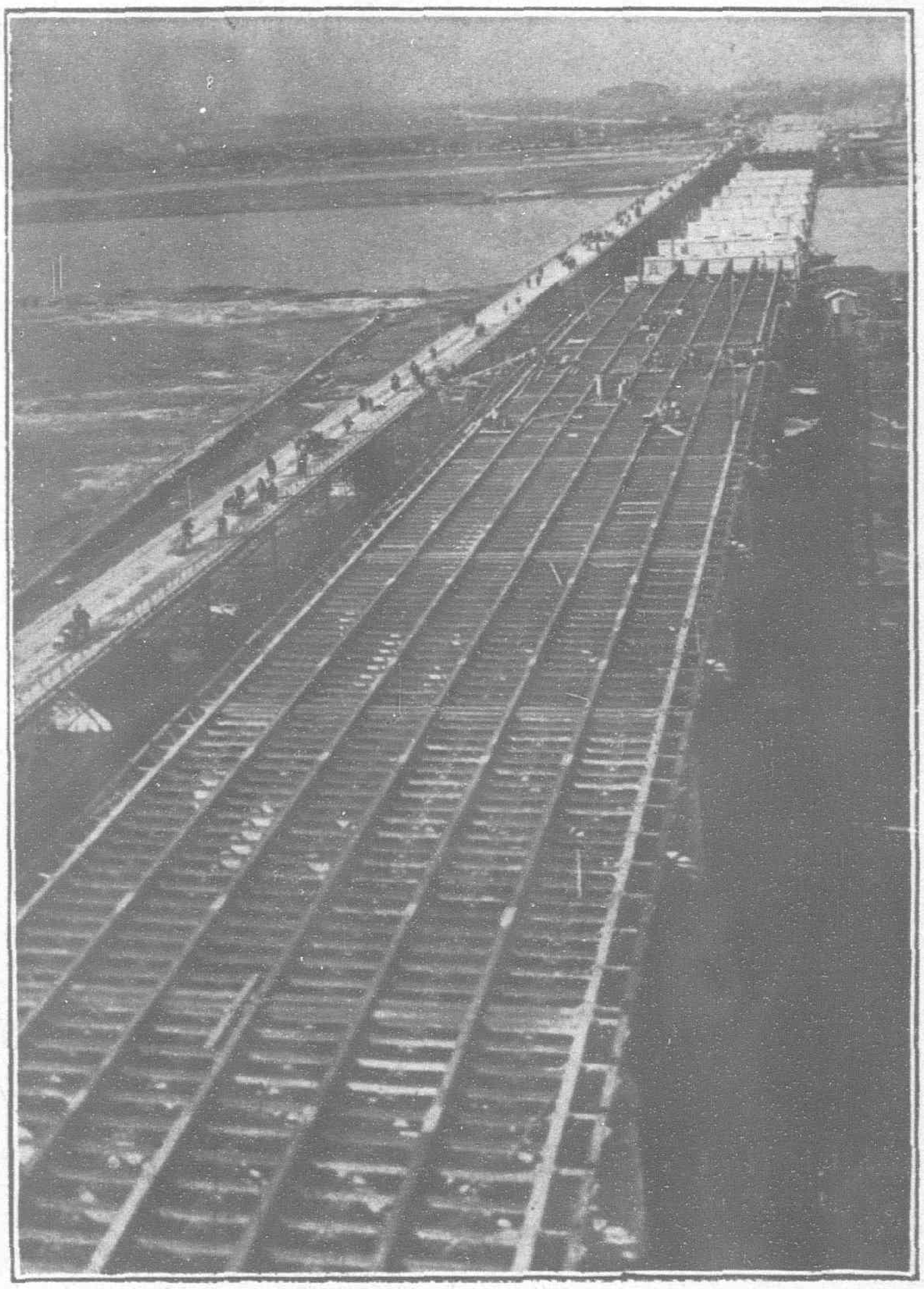
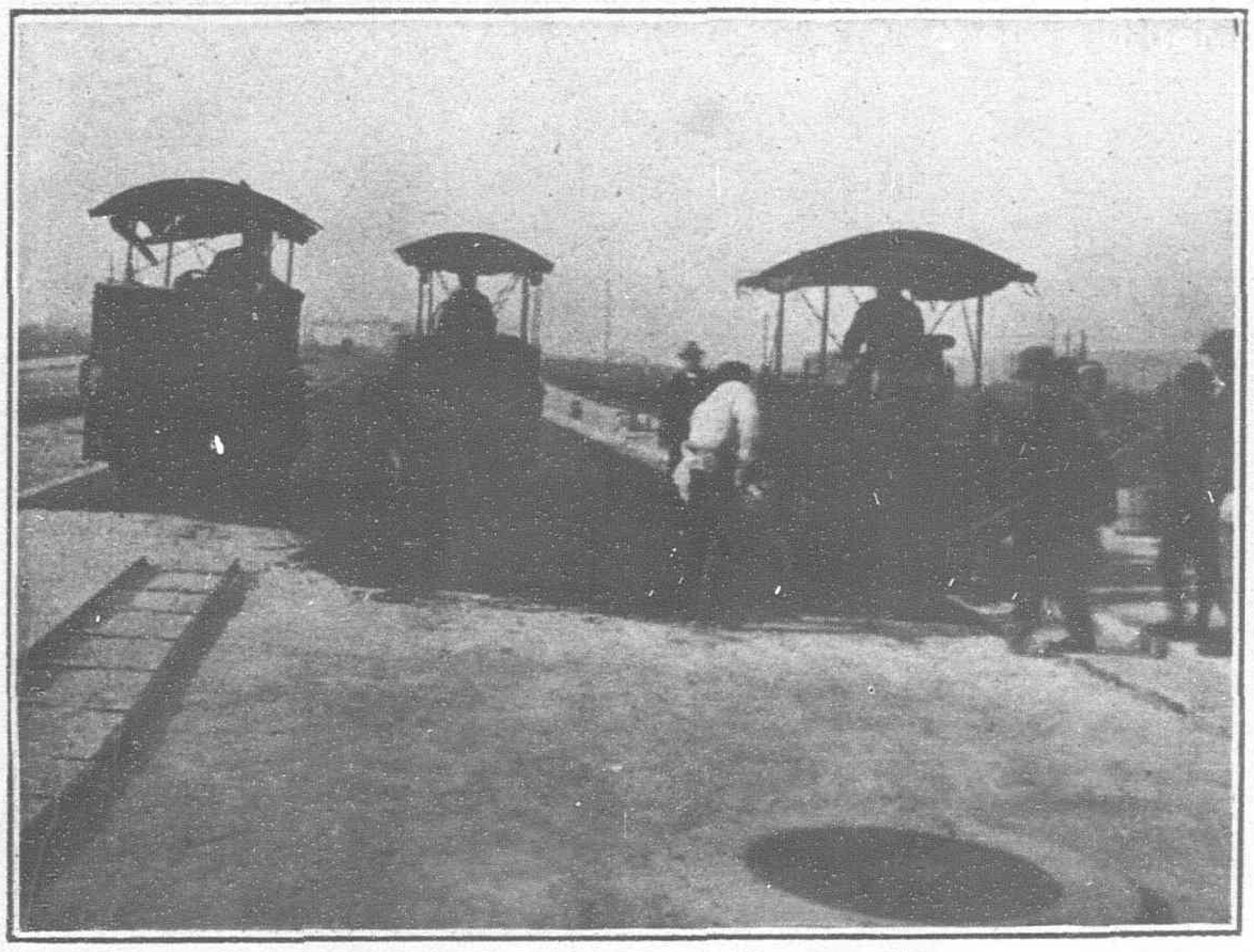


Plate girder erection on the high water basin; seven girders are spanned across piers the side space between the girders being 10 feet each; the length of the plate girder is 20 feet 10 inches, and the height between the flanges is six feet. The bracket on the extreme sides are for the purpose of supporting the side-walks. The bridge on the left hand side is the Nishinari Ohashi

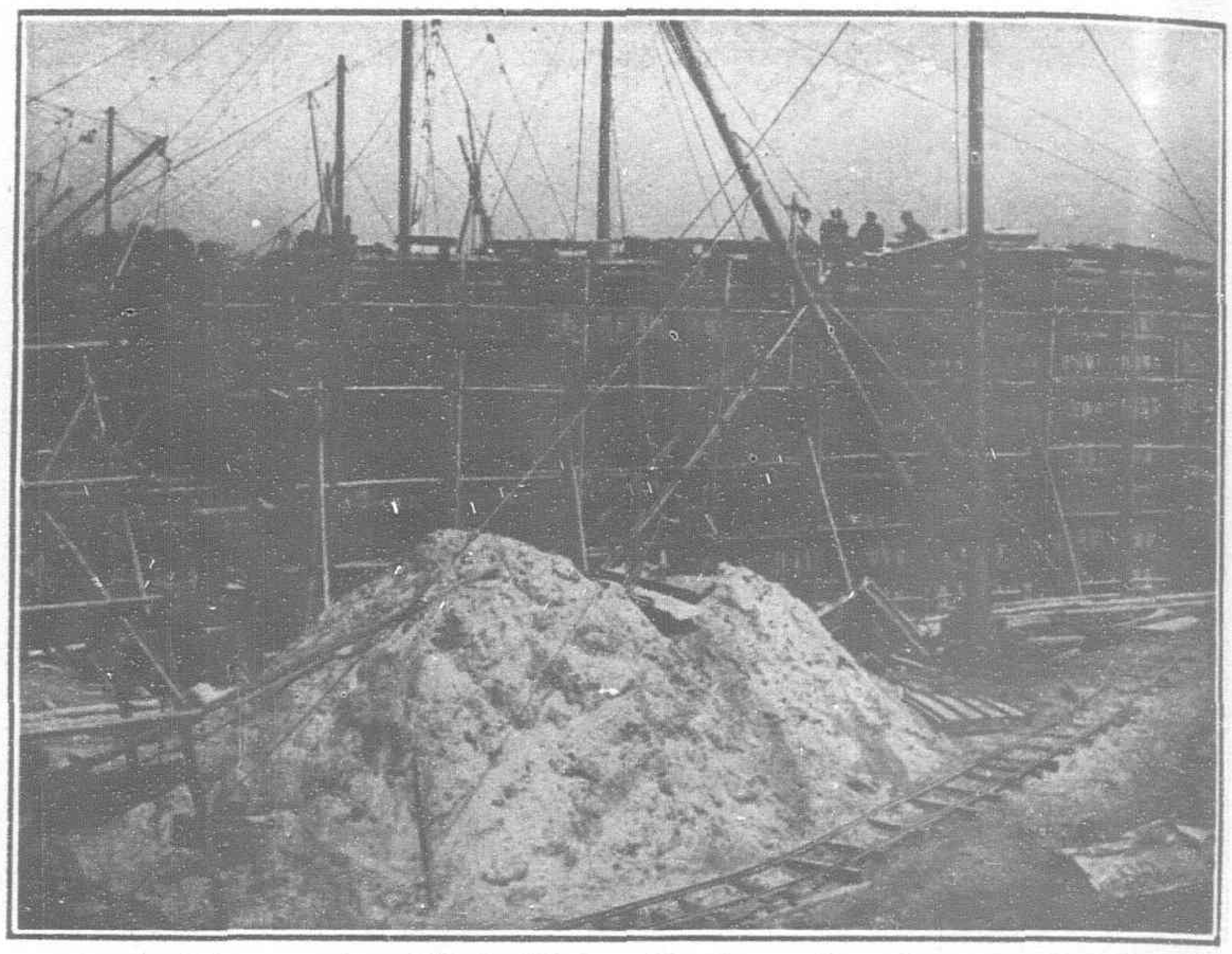
The construction of the Osaka-Kobe state road at last was commenced in November, 1922, with the estimated cost of 20,000,000 yen simultaneously at Nishonoda, Osaka, and Iwaya, Kobe. The construction of the state road is now almost completed; it extends to approximately 14 miles. On this road will be built a slow-going double-track electric tramway, connecting the two cities in one hour and 10 minutes; the construction of this tramway has just started, to be completed also toward the end of this year. Upon completion, 30 steel-cars will be operated, leaving both termini every six minutes.

Construction of the Yodo-gawa Ohashi

There are 49 bridges already built or still under construction on the Osaka-Kobe state road; of this total, there are four bridges of which the



Steam Rollers for Road Construction



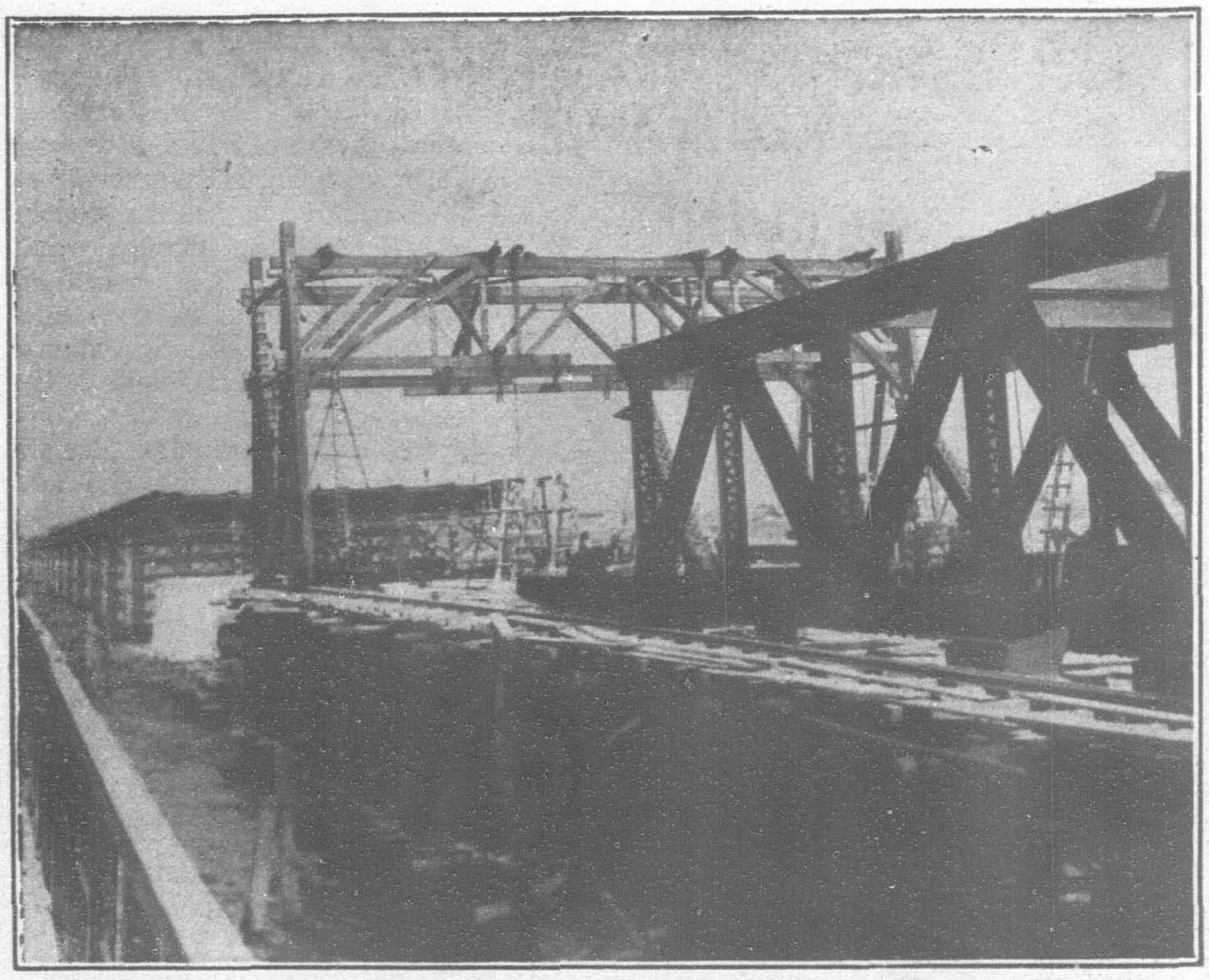
A Pier on the High Water Basin under Construction.

length is longer than 300 feet. They are the Yodo-gawa Ohashi, 2,412 feet, Kanzaki Ohashi, 741 feet, Muko Ohashi, 684-ft., and Samonbashi, 486-ft. The Yodo-gawa Ohashi is thus the longest of the 48 bridges of the Osaka-Kobe state road.

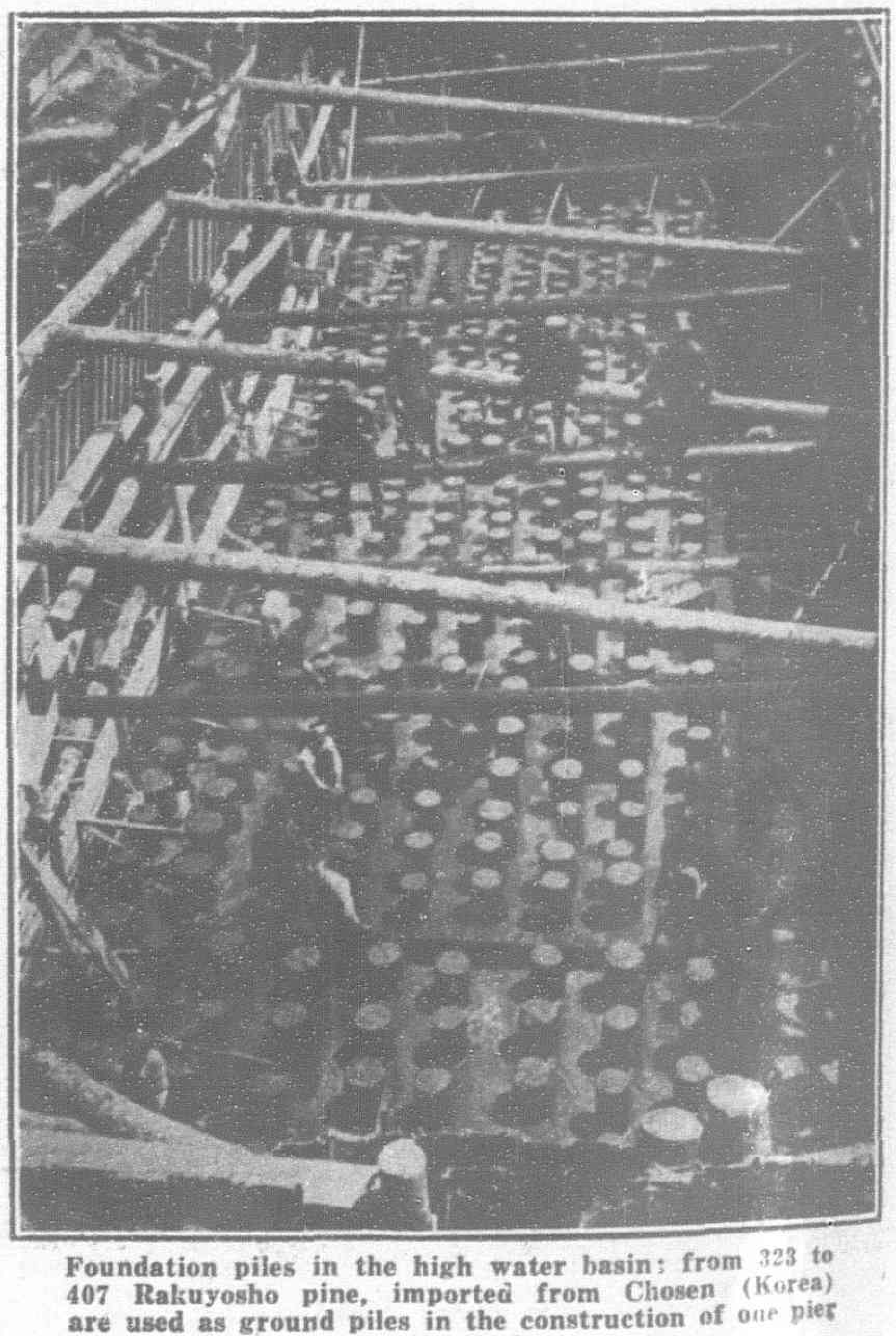
The Yodo-gawa Ohashi spans over the Shin-Yodo-gawa or the New Yodo River. The Yodo River rises in Lake Biwa and empties into Osaka Bay, running through the city of Osaka; its water having frequently overflowed the banks, a new water way was cut from the north eastern corner of the city of Osaka toward south-west strait to the sea, thus regulating the quantity of the water of the Yodo River running through the city of Osaka; this water way is the New Yodo River, across which the Yodo-gawa Ohashi is now being built.

Across the huge New Yodo River are

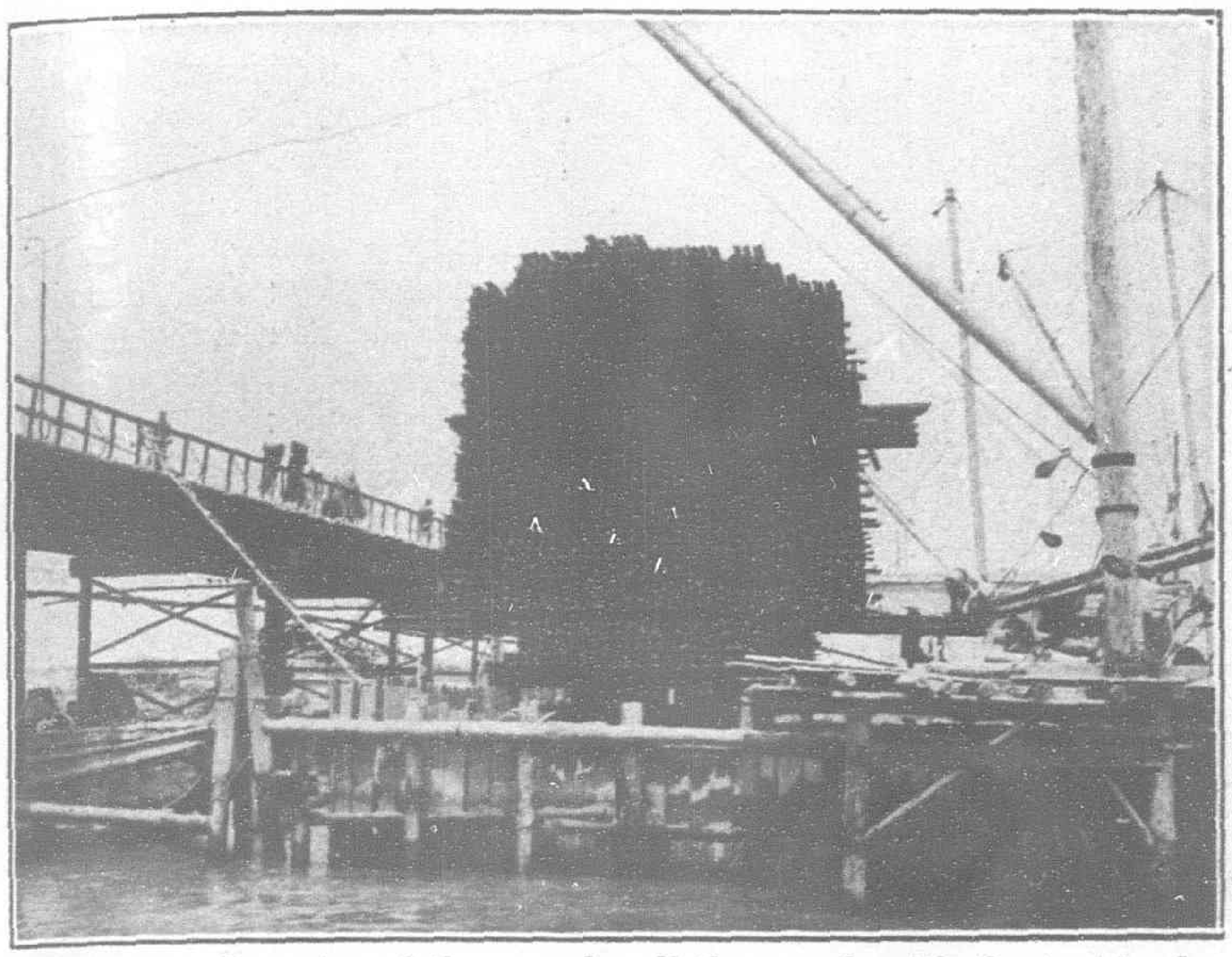
Concrete Piping on the New Roads



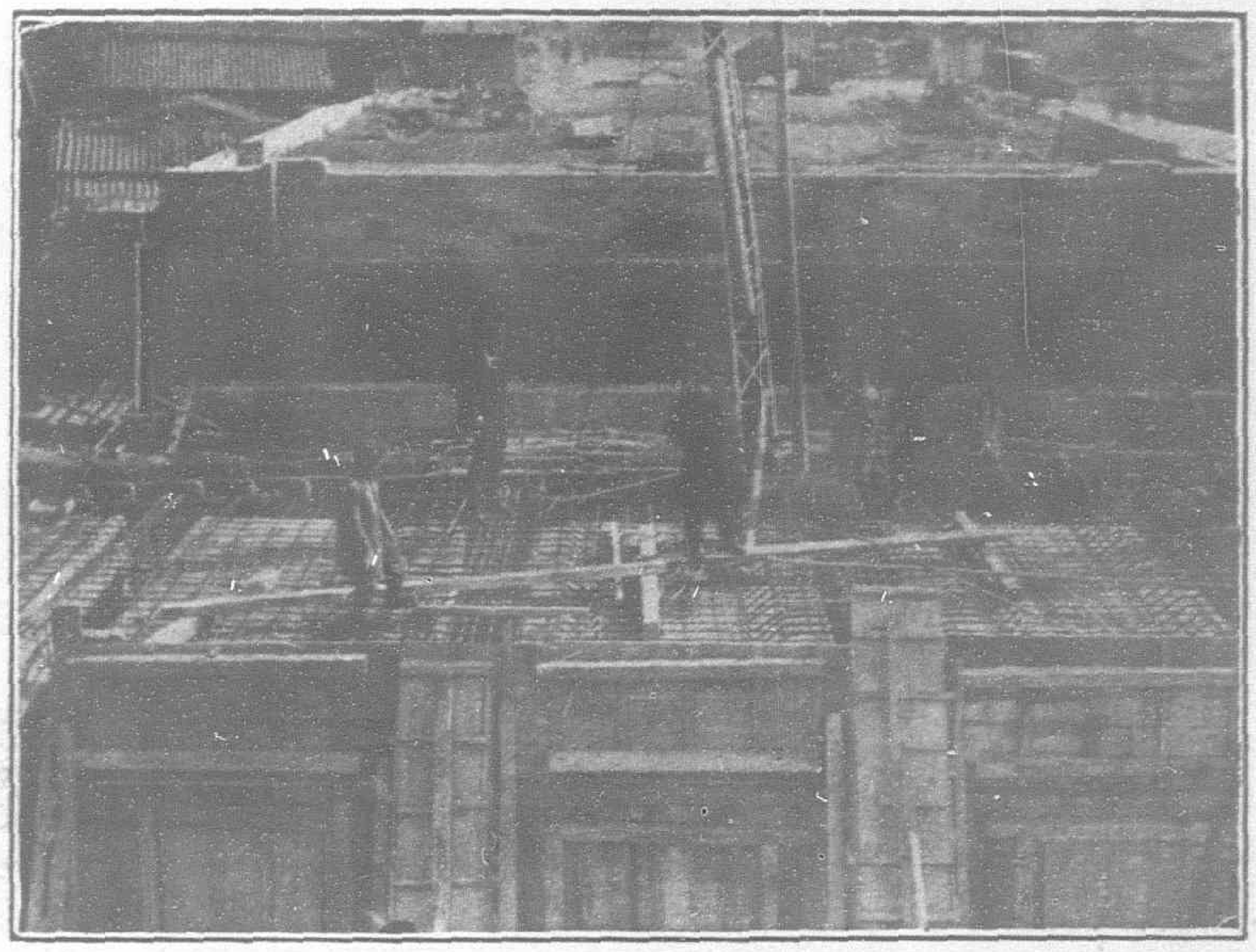
Erection of Truss (Type-Wallentype) Clear Span 108-ft.-0-in. Depth 12-ft.-0-in.



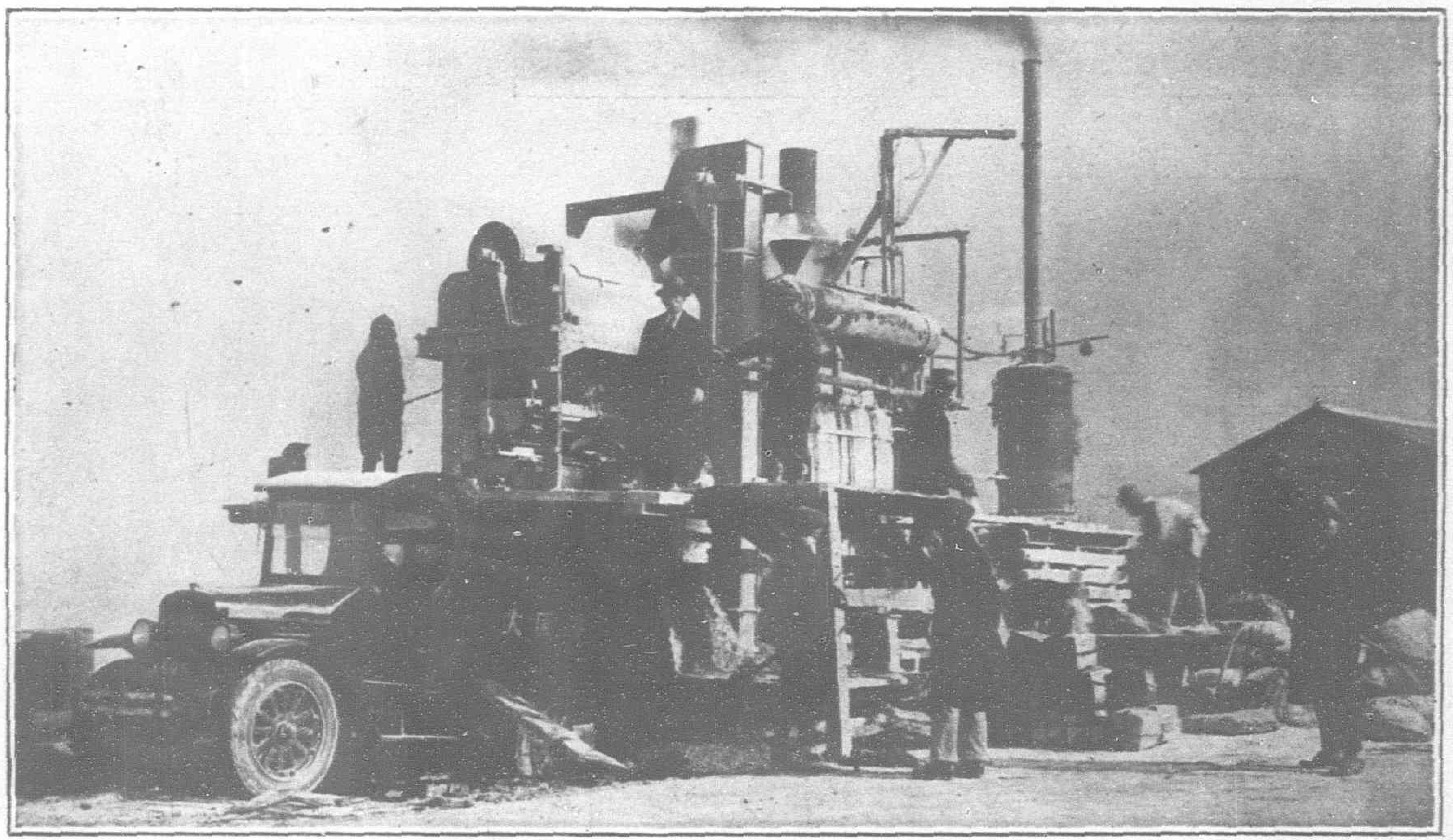
Foundation piles in the high water basin: from 323 to 407 Rakuyosho pine, imported from Chosen (Korea) are used as ground piles in the construction of one pier of the bridge



The outer diameter of the round well thus sunk with the test load on top is 12 feet; the wall is 2 feet thick, and the length is approximately 70 feet.



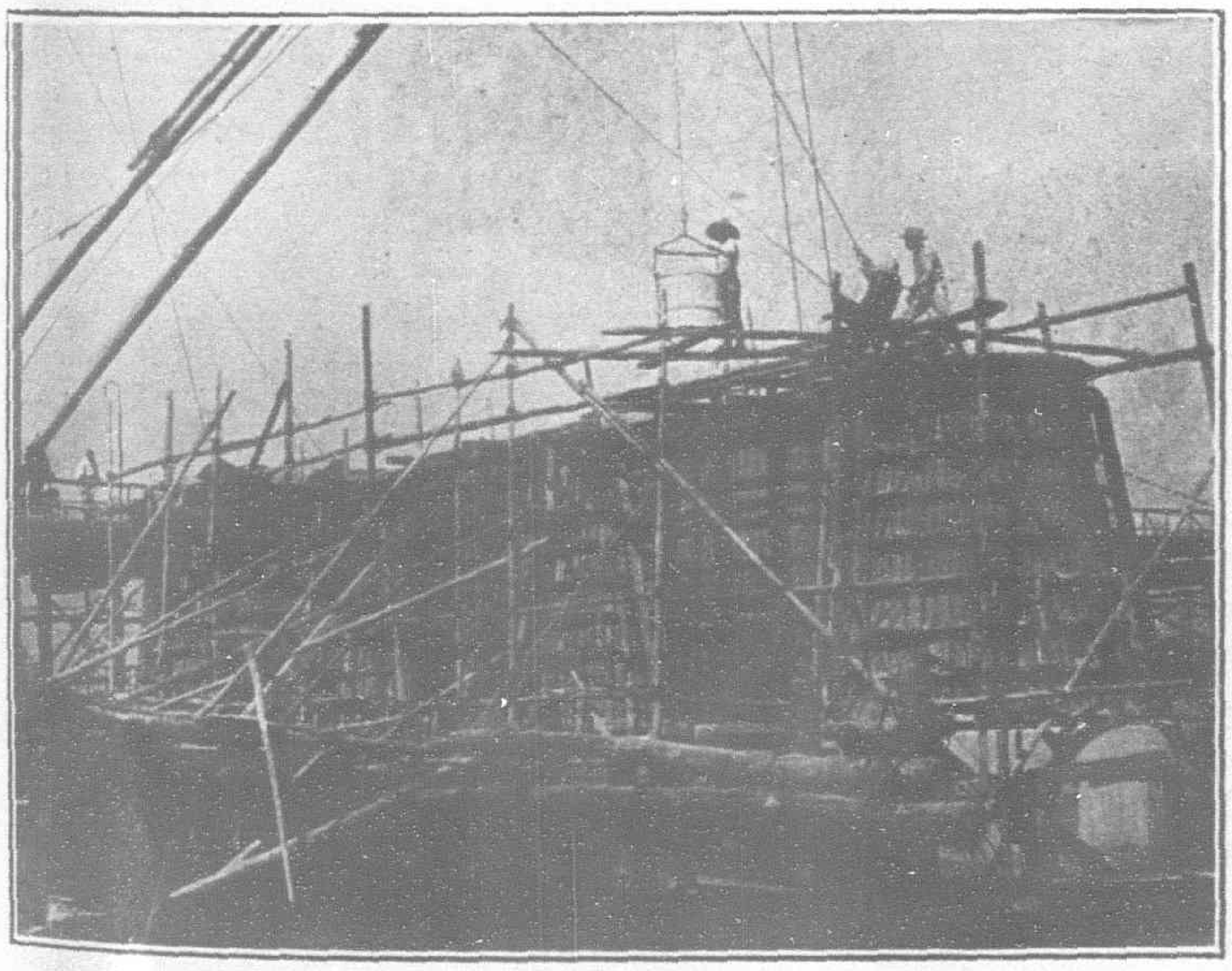
The abutment of the Yodogawa Kohashi or the adjoining bridge which spans over the canal; the canal runs along the southern bank of the New Yodo-River.



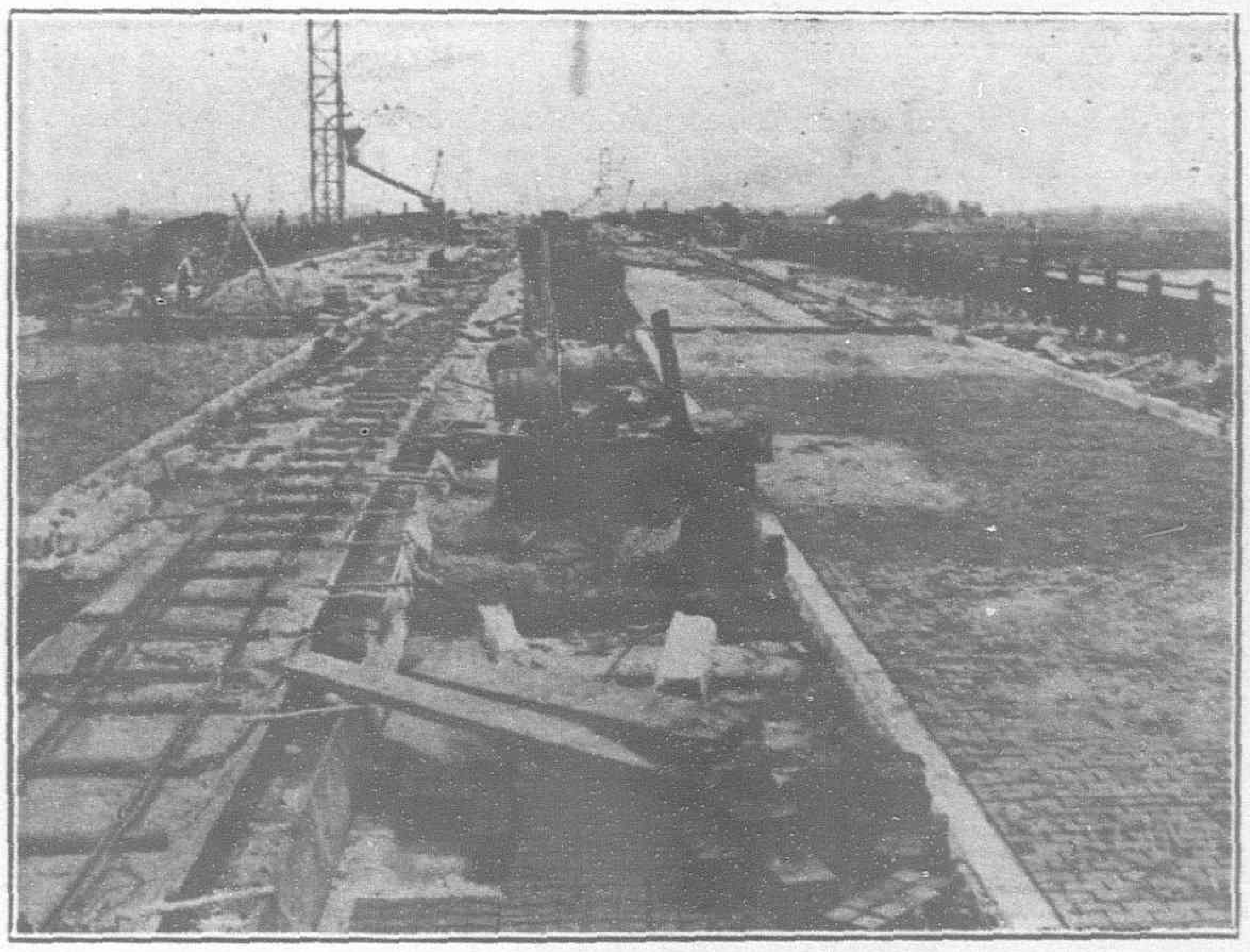
Mosher Type Asphalt Making Machine

built three bridges, i.e., the Nagara-bashi, the Juso-bashi, and the Nishinari Ohashi, but these bridges are of temporary structure, so to speak. On building the Yodo-gawa Ohashi, it was decided that it should be built at a point of about 70-ft. up the stream, from the Nishinari Ohashi, and that the existing Nishinari Ohashi should be removed on completion of the new bridges.

With a view to avoiding the oppressive impression which one receives on going across a "through-type" bridge, the "deck-type" is adopted in the construction of the Yodo-gawa Ohashi, The bridge is divided into three parts; the centre is the low-water-basin part, and the both ends are the high-water-



A pier on the low water basin under construction; nearly completed.

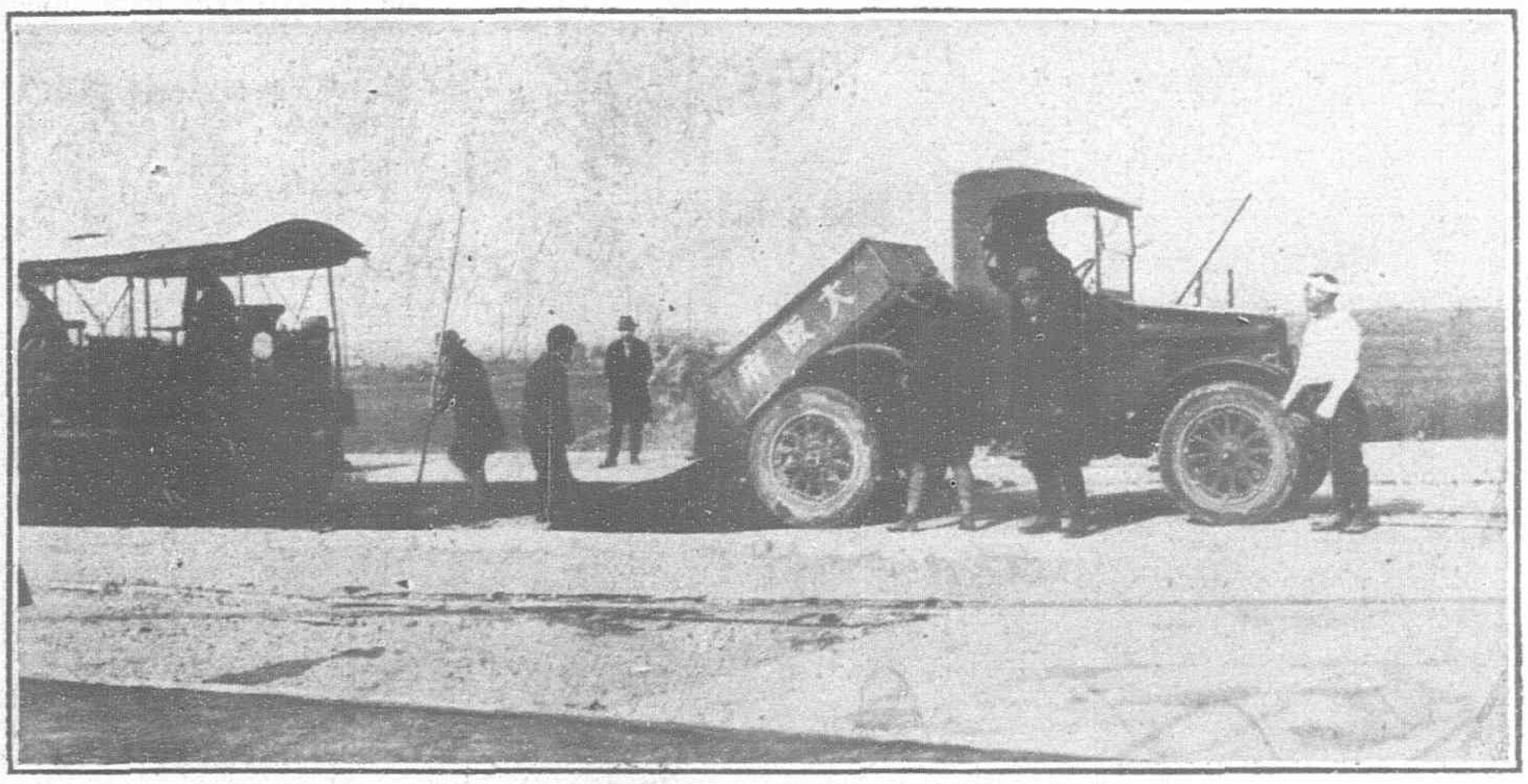


The wooden block pavement work; the effective width of this bridge is 66 feet: the central 18 feet is for the construction of double-track tramway; on both sides of the tramway run the drive way, the width of which is 18 feet each; the sidewalk has a width of six feet

Laying Slab Concrete

basin parts. The low-water-basin part is supported by seven piers, and the six intervals of the piers are 108-ft. each; the distance between the two piers of the high-water-basin parts is 72-ft. and there are 12 intervals on each of the high-water-basin parts or 24 intervals in all.

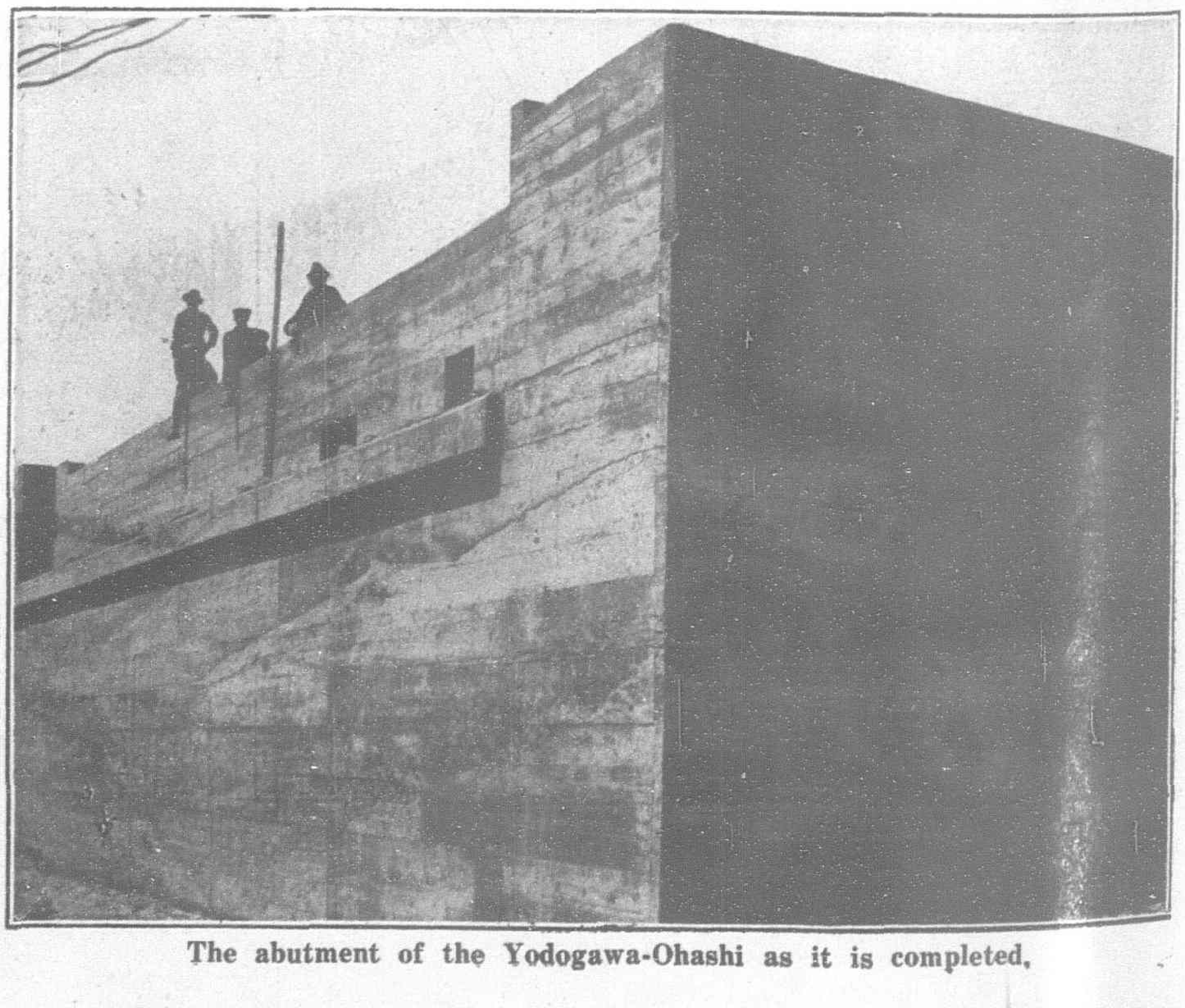
The effective width of the surface of the bridge is 66-ft.; the surface is divided into five parts; the centre is the tramway, the width being 18-ft. On both sides of the tramway runs the drive way, the width of which being 18-ft. each. The two extreme edges are side-walk, and the width is six-ft. each.



The Motor Transportation of Materials.

For the sake of convenience, the construction of the Yodo-gawa Ohashi was divided into six phases, and as a result of the private tender, the contracts were awarded as follows:

Work	Successful Bidders
1. Abutment and pier building. (Ground piles and cement supplied) ..	Obayashi-gumi
2. Girder Manufacturing..	Osaka Iron Works, Ltd.
3. Girder Installation	Obayashi-gumi
4. Bridge-flour, rails, etc. (Cement and Self-centring supplied)	Obayashi-gumi
5. Painting	Toa Paint Mfg. Co., Ltd.
6. Bridge-surface pavement	Obayashi-gumi



The abutment of the Yodogawa-Ohashi as it is completed.

Abutment and Pier Building

The abutments and piers are of reinforced concrete. The abutment stands on 303 ground piles, Rakuyosho-pine, top diameter, 8 inches, length 30 feet, in addition to 18 ground-piles, also Raku-yosho-pine, top diameter, 7 inches, length, 30 feet. Every high water-basin pier stands on from 332 to 407 ground piles, either Rakuyosho-pine or Oregon pine, top diameter, 8 inches, length, 30 feet. The number of ground piles used in the construction of the abutments and piers totalled 8,168.

The low-water-basin pier consists of four round-wells, the outer diameter of which is 12 feet, the thickness, 2 feet, and the length is about 70 feet, sinking deep into the ground. The inside of the wells are filled with sand.

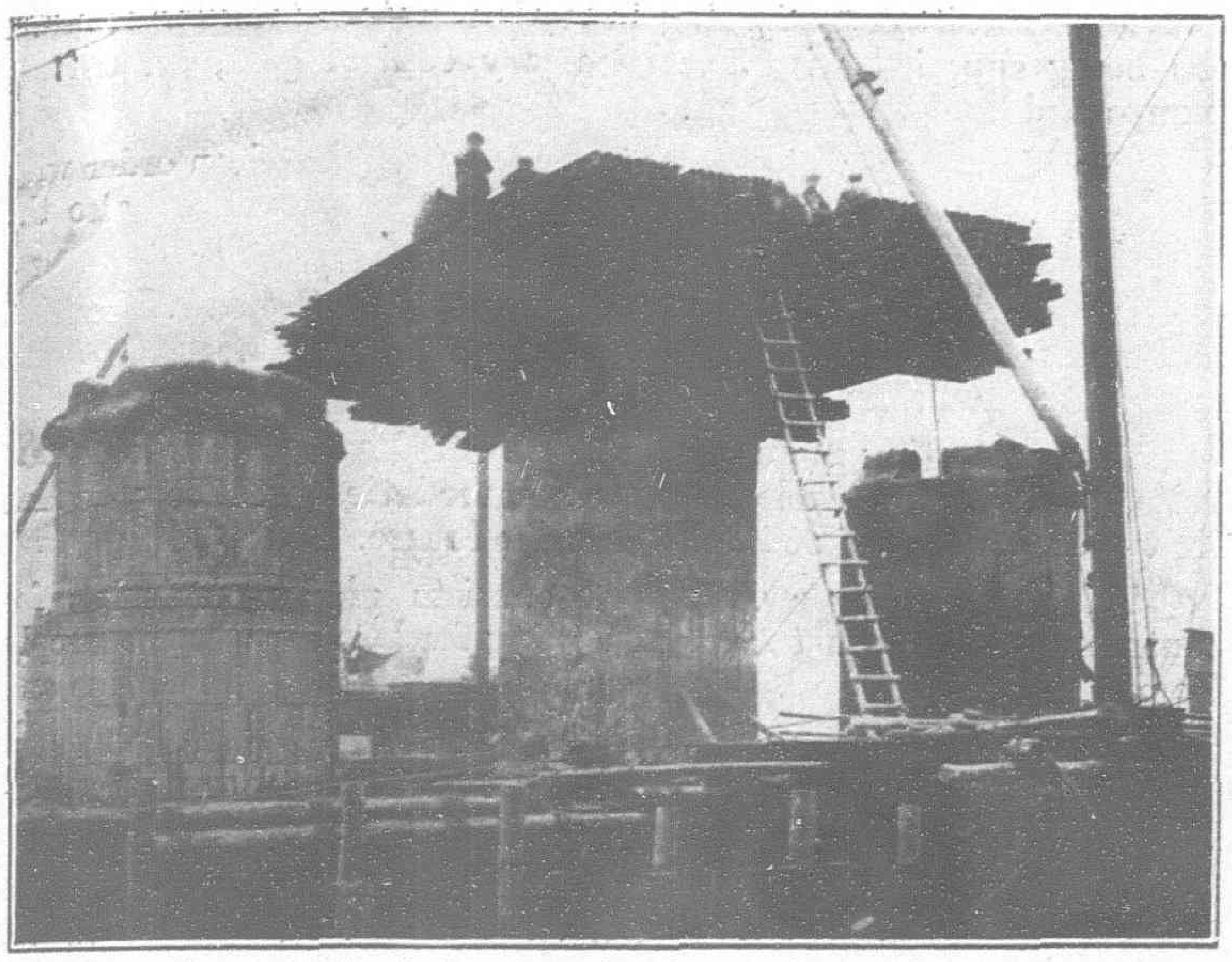
The ground piles which were supplied by the Osaka Prefectural Government to the Obayashi-gumi, one of the most influential contractors in Japan, were mainly imported from Swishin, Chosen (Korea), by Tomida Shoten. The work of the ground pile sinking progressed at the rate of from 7 to 20 piles a day per one electric-driven pile-driving machine. Steam driven pile drivers were also used.

Two elevator towers were set up at the edge of the high-water-basin at the two outer extremes of the low-water-basin in order to convey concrete by shoot, but in the construction of piers which were located far from the elevator, cement mixers were operated individually, and the concrete was conveyed by individual winches.

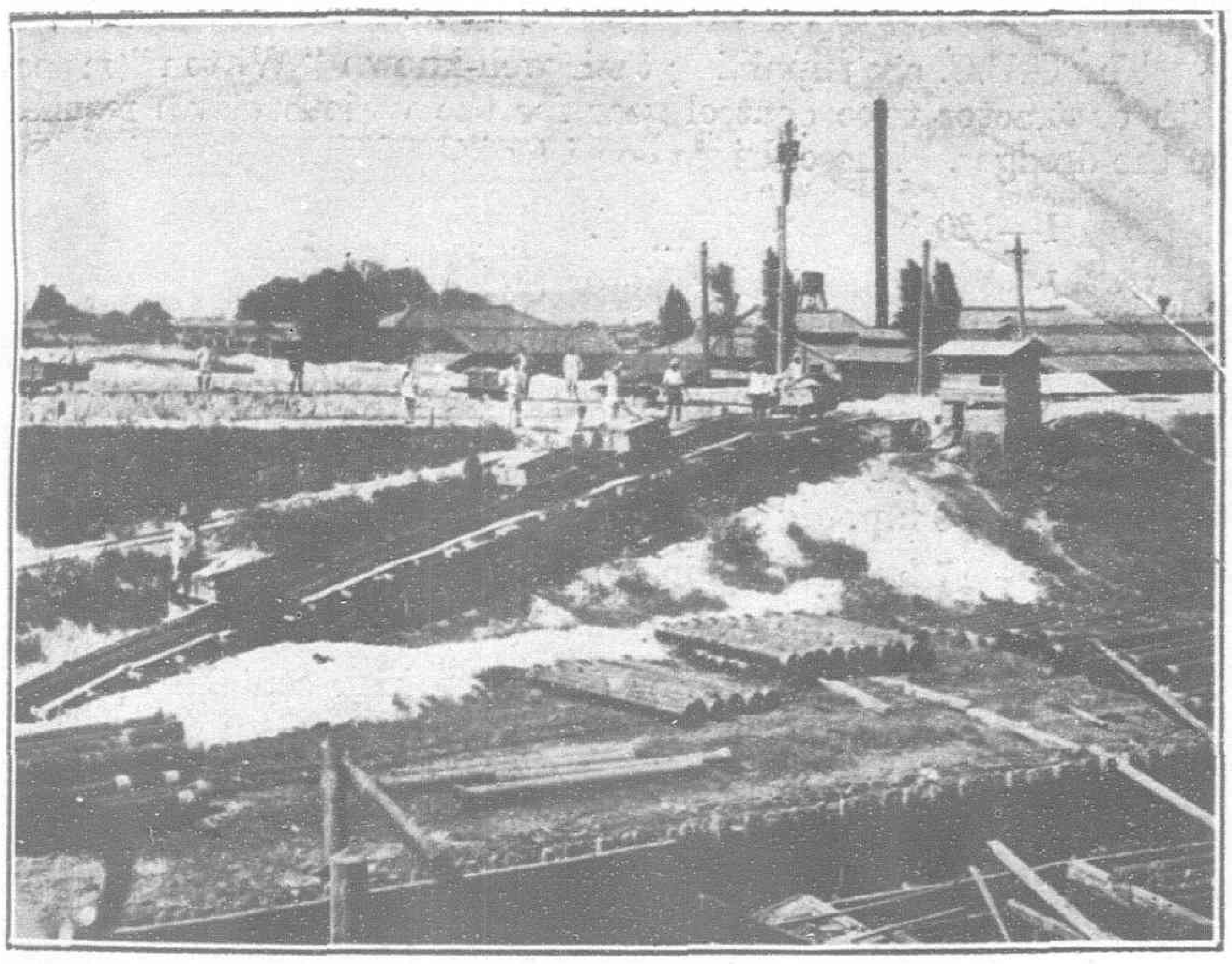
The sinking of the round-wells in the low-water-basin progressed at the rate of about 1.5 feet a day. The test load of the each well was 500 tons. The Osaka Prefectural Government prepared 2,000 tons of old rails in this connection.

Girder Works

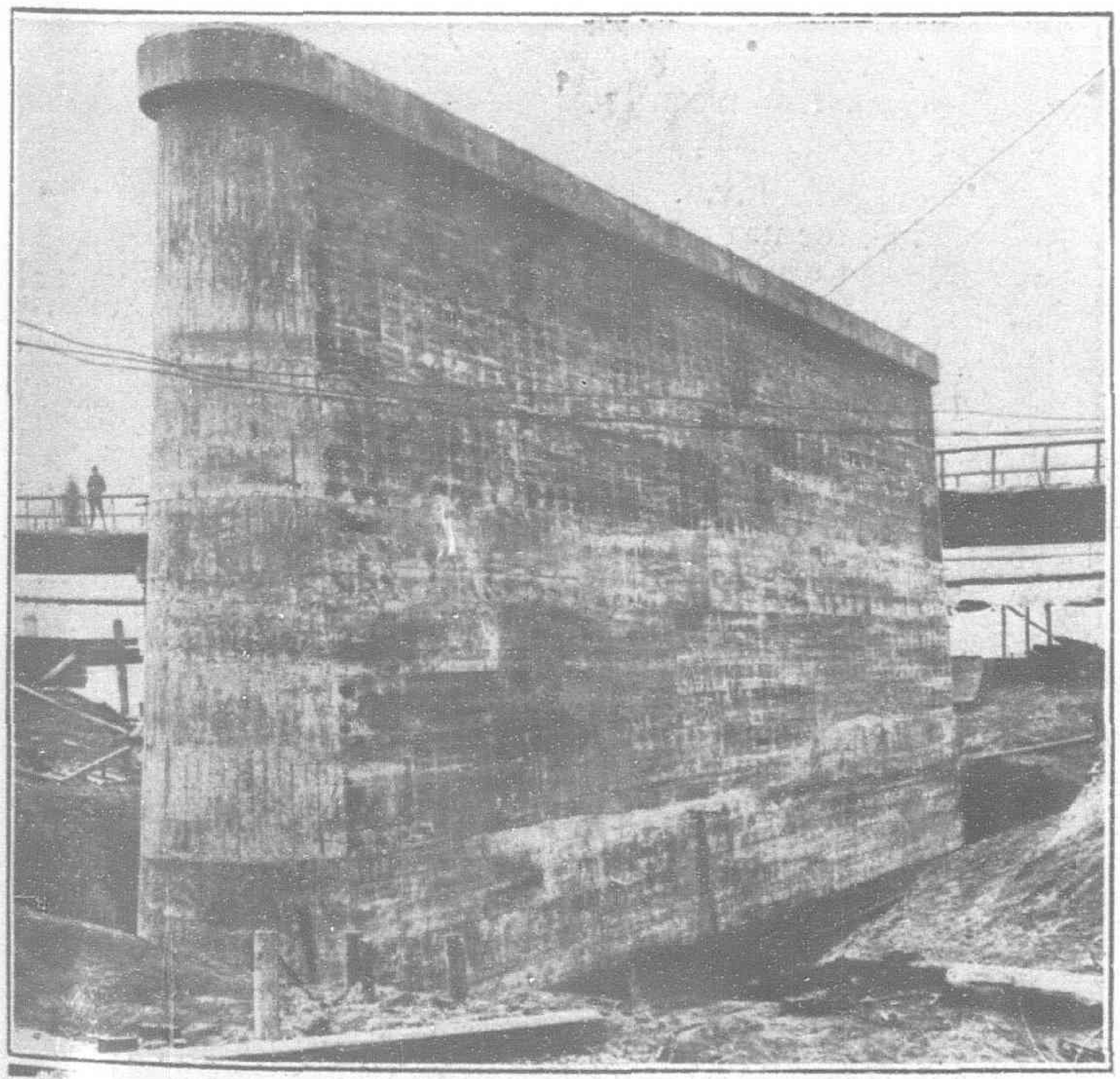
Something like 4,500 tons of steel materials were required in the manufactures of girders used in the Yodo-gawa Ohashi.



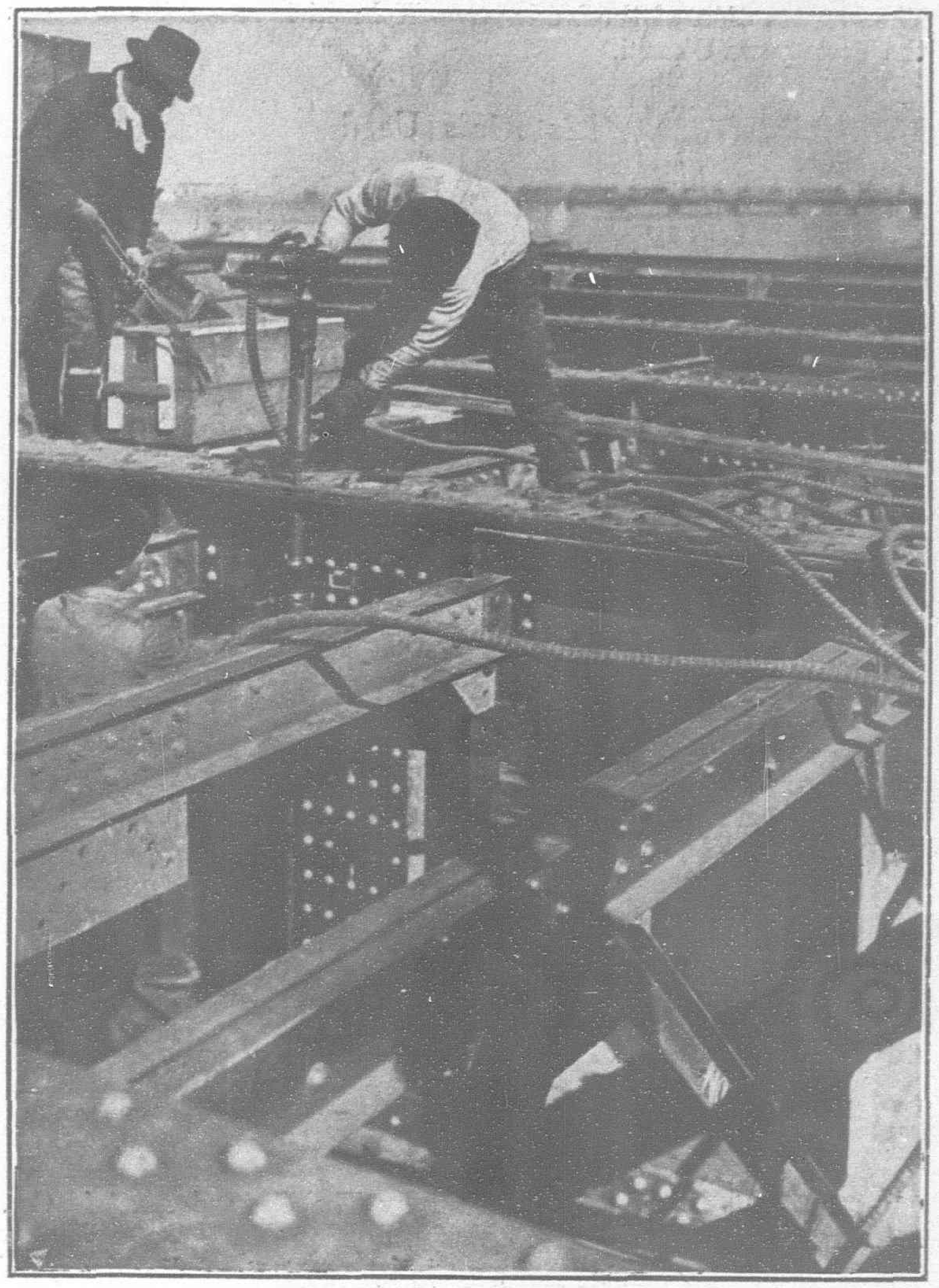
Sinking of round-well of the pier: the pier consists of four wells, which are hollow tubes made of reinforced concrete; they are sunk deep into the ground with test load of 500 tons on top. This picture show that the test load, i.e. rails, are being piled up on top of the round wells



The Road Construction Lay-Out



One of the piers of the bridge established on the high water basin.



Rivetting on the Yodogawa-Ohashi.

The Osaka Iron Works, which made the girders, obtained the supply of the steel plates entirely from the Yawata Government Iron Works. As regards the cast steel, a portion of it was supplied by the Kobe Steel Works and the Yawata Government Iron Works, but most part of it was imported from foreign countries. The manufacture of girders started in August, 1925, and was completed in December, same year, the time required being five months.

In the high-water-basin parts, seven plate girders each are spanned across the piers, the side space between the girders being 10 feet each. The length of the each plate girder is 71 feet 10 inches, and the height between the flange is six feet.

In the low-water-basin part, four Wallen type truss are spanned across the piers, the side space between the truss being 20 feet. The length of the truss is 170 feet and 10 inches, and the height is 12 feet.

Other Details

In the purchase of the self-centring, which is used in the bridge-floor building, the contract was awarded to Asano Bussan Kabushiki Kaisha (the Asano Products Co., Ltd.), which bought them from the General Fire Proofing Company of the United States.

The wooden blocks were purchased from Toyo Bofu Mokuzai K.K. (the Oriental Antiseptic Lumber Co., Ltd.); the size is, length, five inches, width, three inches, and the height, three inches. The quantity of the antisepectic used is at the rate of three sho per one cubic foot. The block laying progressed at the rate of from 10 to 18 tsubo per day a man. The asphalt was purchased from the Asano Products Company.

Construction of Yodo-gawa Kohashi

Along the southern bank of the New Yodo River flows the Nakatsu River or a canal; across the canal is built a new bridge called the Yodo-gawa Kohashi or the Minor Bridge of the Yodo River, in connection with the Osaka-Kobe state road building.

The construction of the Yodo-gawa Kohashi is much the same as the Yodo-gawa Ohashi.

Materials Used

Items	Unit	Yodo-gawa Ohashi	Yodo-gawa Kohashi
Ground piles		8,168	850
Portland Cement	Barrels	36,748	3,002
Steel for reinforced concrete	L. ton	577.56	34.61
Girders	L. ton	4,342	144.9
Stone	cubic foot	7,713.2	1,244.6
Wooden blocks		529,916	28,682
Asphalt cement	kamme	16,773	912.8
Self-centring	square foot	162,053.05	5,644

Cost of Construction

Unit : yen)

Items	Yodo-gawa Ohashi	Yodo-gawa Kohashi
Abutment and piers	952,604	82,299
Girders, manufacturing, transportation, installation and painting	976,570	30,107
Bridge floor, rails, etc.	228,672	14,066
Bridge-surface pavement	98,974	6,116
Total	2,256,820	132,588

G. E. C. Contracts

A CONTRACT has been secured by The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2., and Witton Works Birmingham, from the East Indian Railways, in connection with their new Power Station at Lucknow.

The contract comprises the following generating plant, switchgear and transformers :—

4—600 k.w. and 1—300 k.w. 3-phase alternators, for use on a 3,300 volt, 50 cycle system, and running at a speed of 375 r.p.m.

A steel plate switchboard for controlling the above alternators, with feeder circuits for connection to 2—250 k.v.a. Transformers, each having a voltage ratio of 3,300/400 volts.

A further steel plate switchboard, which contains control gear for use on feeder circuits connected to the low tension side of the above transformers.

A number of small squirrel cage motors are also being supplied, for driving the auxiliary plant in the Power station.

In view of the present controversy in connection with the Government Electricity-Bill regarding the standardisation of periodicity, it is interesting to note that the G.E.C. has received an order from the Birmingham Corporation for :—

2—550 k.v.a. Frequency changers for converting from 500 volts 25 cycles to 11,000 volts 50 cycles, the speed of each set being 500 r.p.m.

As a result of the increasing demands for re-organization of the Coal Industry in Great Britain, Messrs. The Lydney & Crump, Meadow Colliery Co., Cinderford, has decided to erect an out-door sub-station for receiving current from the West Gloucestershire Power Co., the supply being at 33,000 volts 3 phase 50 cycles.

The G.E.C. has secured the contract for the whole of the sub-station equipment which includes isolating switches, insulators, bus bars and framework. The line pressure is reduced to 3,300 volts by three 500 k.v.a. G.E.C. step-down transformers connected to the supply through a G.E.C. Truck type Cubicle switchboard, which also provides for a number of feeder and metering circuits.

A further step-down transformer provides a 440 volt 3 phase 50 cycle system for distribution underground.

Four "Witton" slip ring induction motors totalling 600 h.p. are being supplied with the necessary control gear, for driving pumps and haulage purposes.

The Kamunting Tin Co., Singapore, has placed an order with the G.E.C. for generating plant in the Power House and also the electrical equipment for a mining dredger.

In addition to the electrical plant the G.E.C. has secured the contract for the power house building, including a 10-ton crane and gantry and a 2 ton slip winch.

The generating plant consists of a 350 k.v.a. alternator, 2,200 volts, 3 phase, 50 cycles, and accommodation will be provided for two larger sets to be installed in the future.

The steel plate switchboard consists of four cubicles, for controlling the alternator and outgoing feeder circuits, the supply from the power house being transmitted by an over-head line and underground cables.

Power is transmitted to the dredger through a moveable water-tight link switch.

On the dredger is installed a G.E.C. outdoor type oil circuit breaker connected to a 350 k.v.a. step-down transformer which reduces the pressure from 2,200 to 400 volts.

The low tension side of this transformer is connected through another oil circuit breaker to a 13-way ironclad Distribution Board, which supplies power for the motor circuits.

The G.E.C. are supplying their well-known "Witton" motors with contractor type control gear for the various drives required on the dredger. These drives consist of the following :—

1—120 h.p. Pump motor.
1—120 h.p. Digging Motors.
1— 60 h.p. Ladder hoist motor.
1— 25 h.p. Mooring Winch motor.
1— 25 h.p. Screen Winch motor.
2— 16 h.p. Jig motors.
1— 17 h.p. Ship Winch motor.
1— 5 h.p. Jig motor.
2— 1 h.p. motors for driving 2 inch centrifugal Pulsometer pumps.
1— 50 h.p. Pump motor.
1—140 h.p. pump motor.

The contract includes the whole of the power transmission cables, which are of the paper insulated, lead covered, and armoured type and manufactured by the Pirelli General Cable Works at Southampton—one of the many associated enterprises of the G.E.C. organization.

The G.E.C. has recently received orders from the London Electric Power Co., Ltd., for :—

1—25,000 k.v.a. G.E.C.—Fraser & Chalmers Turbo-alternator, for use on a 11,000 volt 3 phase 50 cycle system, running at a speed of 1,500 r.p.m. This set is being installed at the Bow Generating Station for the Charing Cross and West End Supply Co.

1—1,200 k.w. Shunt wound generator 180/220 volts 300 r.p.m. direct coupled to a Fraser & Chalmers Diesel engine.

It is interesting to note that the latter is a repeat order, as the G.E.C. has already installed a similar set.

New Power House for East Indian Railway

The General Electric Company of India has secured the order for the complete equipment of a new power house at Lucknow for the East Indian Railway.

New Vessel for Straits

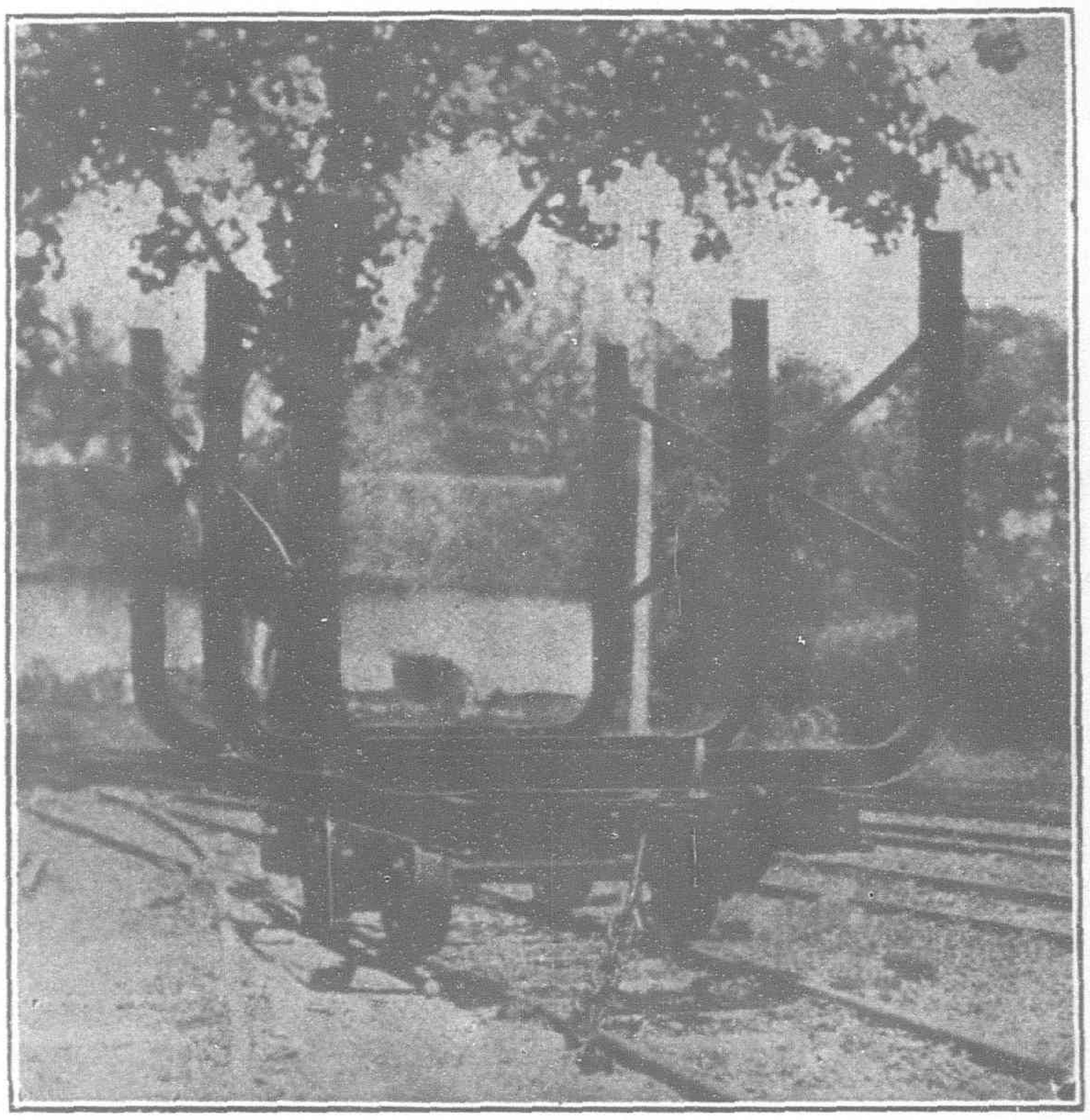
Scotts Shipbuilding and Engineering Company, Greenock, Scotland, have received an order for a small single-screw vessel for the Straits Steamship Company.

Java Sugar Notes

By R. W. Weidenbacker

JAVA as a sugar country ranks second to Cuba with a crop of 19,500,000 tons of cane per year, producing 2,000,000 metric tons of sugar as compared to Cuba's crop of 48,000,000 tons of cane producing approximately 5,000,000 tons of sugar. A notable departure between the two Islands is in the area of land under cane cultivation. Java uses 433,000 acres, while Cuba requires 1,650,000 acres. This difference is due to the methods of cultivation and population of the two countries; Java has 35,000,000 people to support and Cuba only about 3,500,000, which leaves the Cubans free to attend to sugar first without the same attention to problems of food supply which are so important in Java. Another great difference is in wages. With the huge native population living on a very moderate scale, the Java sugar industry has an abundant supply of labor to draw from at wages one-eighth or one-tenth of those prevailing in Cuba.

Due to the necessity of feeding the native population a practice has developed under Government supervision whereby the land in most cases is owned by the natives and leased to the sugar factories for a period of one crop. After each cane crop the land is turned back to the natives for their own use in growing rice, beans, tobacco, etc., and the same land is not returned to sugar until the third year. It follows that crops cannot be ratooned but are seeded fresh each time. Planting is under the direct supervision and control of each factory which, with few exceptions, grows all the cane it grinds. Factory managers and their staffs are expert cane agriculturists and devote much attention to fertilizing, irrigation and cultivation, thus obtaining their high yield per acre. The small farmer, or " colono," who plays such an important part in Cuba, is non-existent in Java.

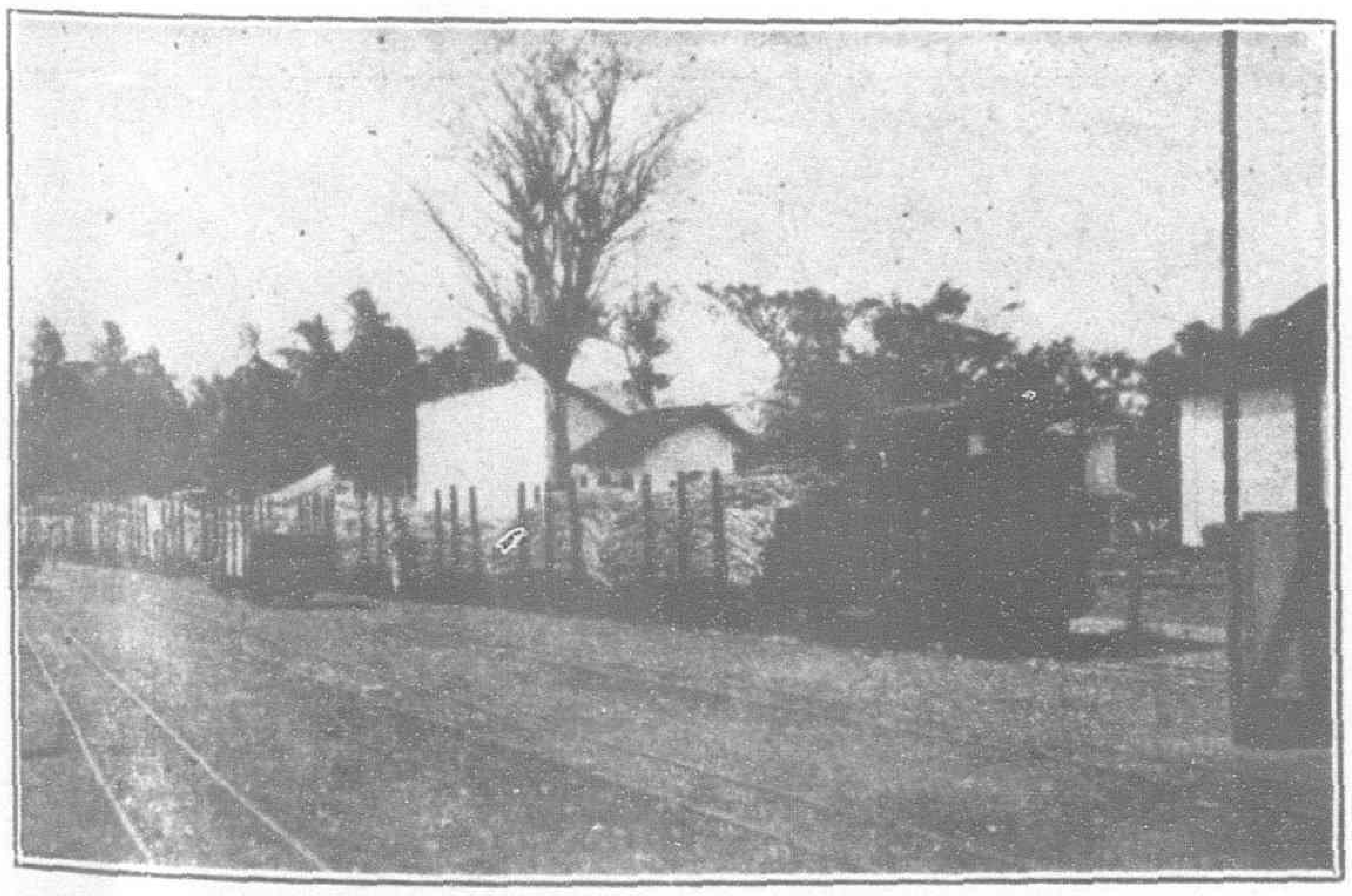


Typical Cane Car—Capacity about 5 tons.

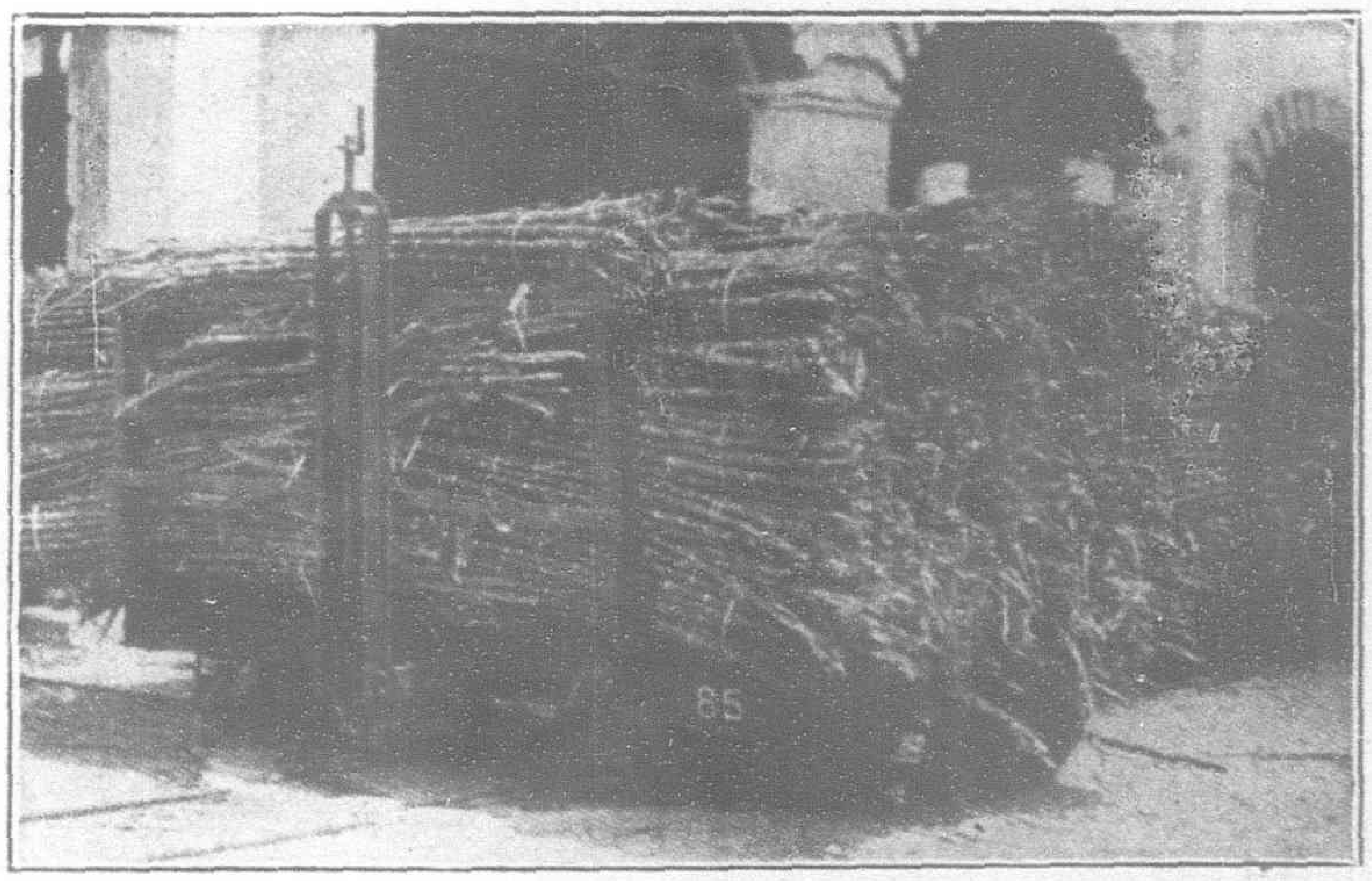
The main arteries of the plantation railways are permanent, but branch lines leading into the fields consist of short sections of light rail, weighing 12 to 20 pounds per yard, attached to light steel cross-ties. This track is portable and moved from place to place as the cane is harvested, and entirely removed during dead seasons when the land is devoted to other crops. Even on permanent plantation lines, the gauge is very narrow, being 2 feet to 2 feet 6 inches, and locomotive and car equipment is very small.

The system of macadam highways is good. There is an unusual prevalence of animal transport with small sized carts, using the old-fashioned high wheel. While such methods are slow and uneconomical of labor, they answer sufficiently in sections where the population is very dense and where it is necessary to employ the natives and their animals. If mechanical transport were used, the natives would be left without means of livelihood while the land is devoted to cane, and the sugar factories would probably be required to feed them. Accordingly, the natives are employed with their oxen to harvest and bring in the cane. As the harvest is carried on during the dry season, no difficulty is experienced with carts becoming mired in the fields: also a great part of the hauling is over well made roads.

Factory boilers are run on ampas (bagasse) and surplus ampas is baled and dried for miscellaneous uses. The general locomotive fuel has been wood, although some coal is used and a number of factories are now using baled ampas. The bales are of large size, measuring about 17 by 22 by 30 inches, and weighing 75 to



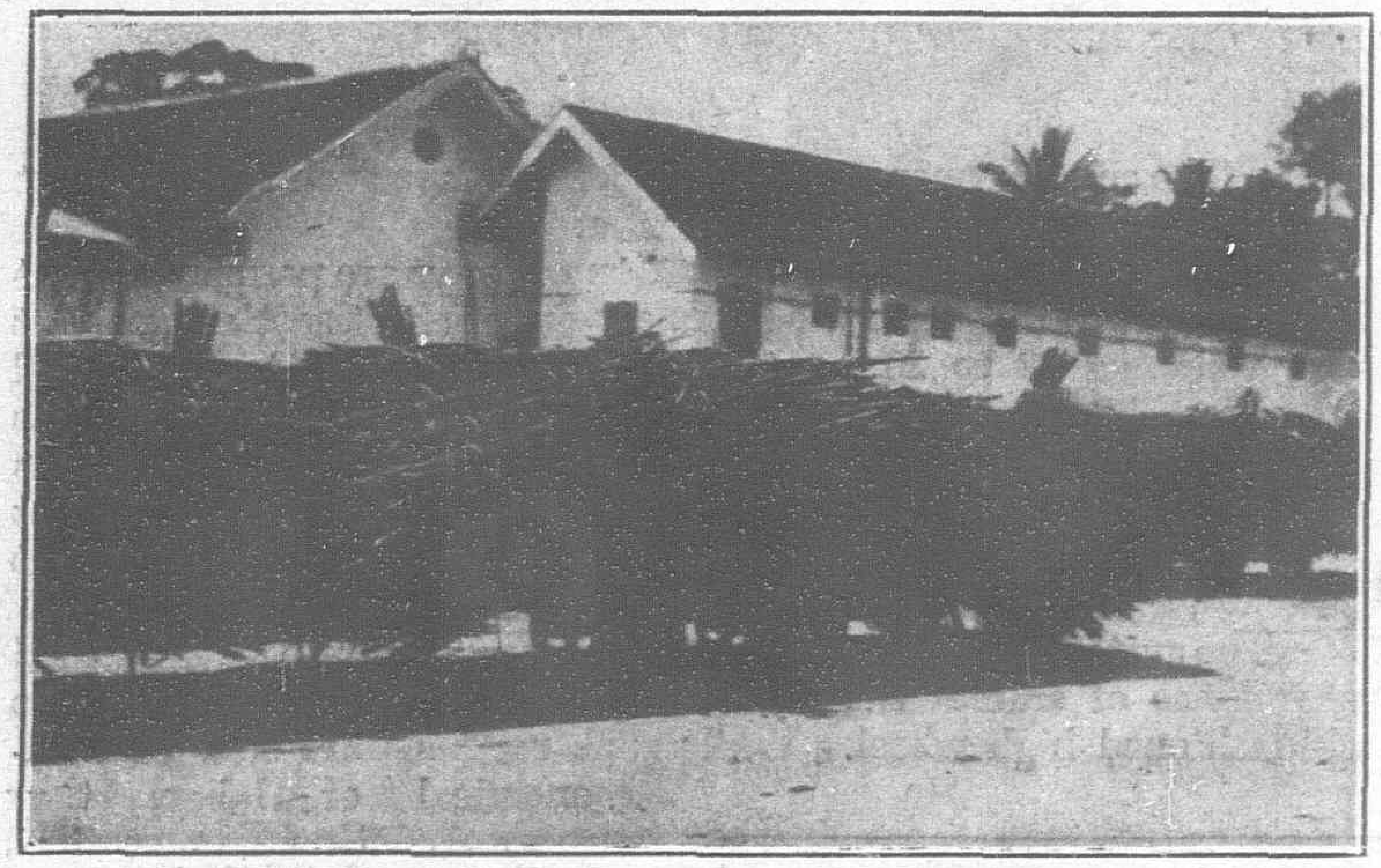
At Djatibarang cane is transported by rail, using locomotives. Cars are brought from fields to main line by coolies or karbouw.



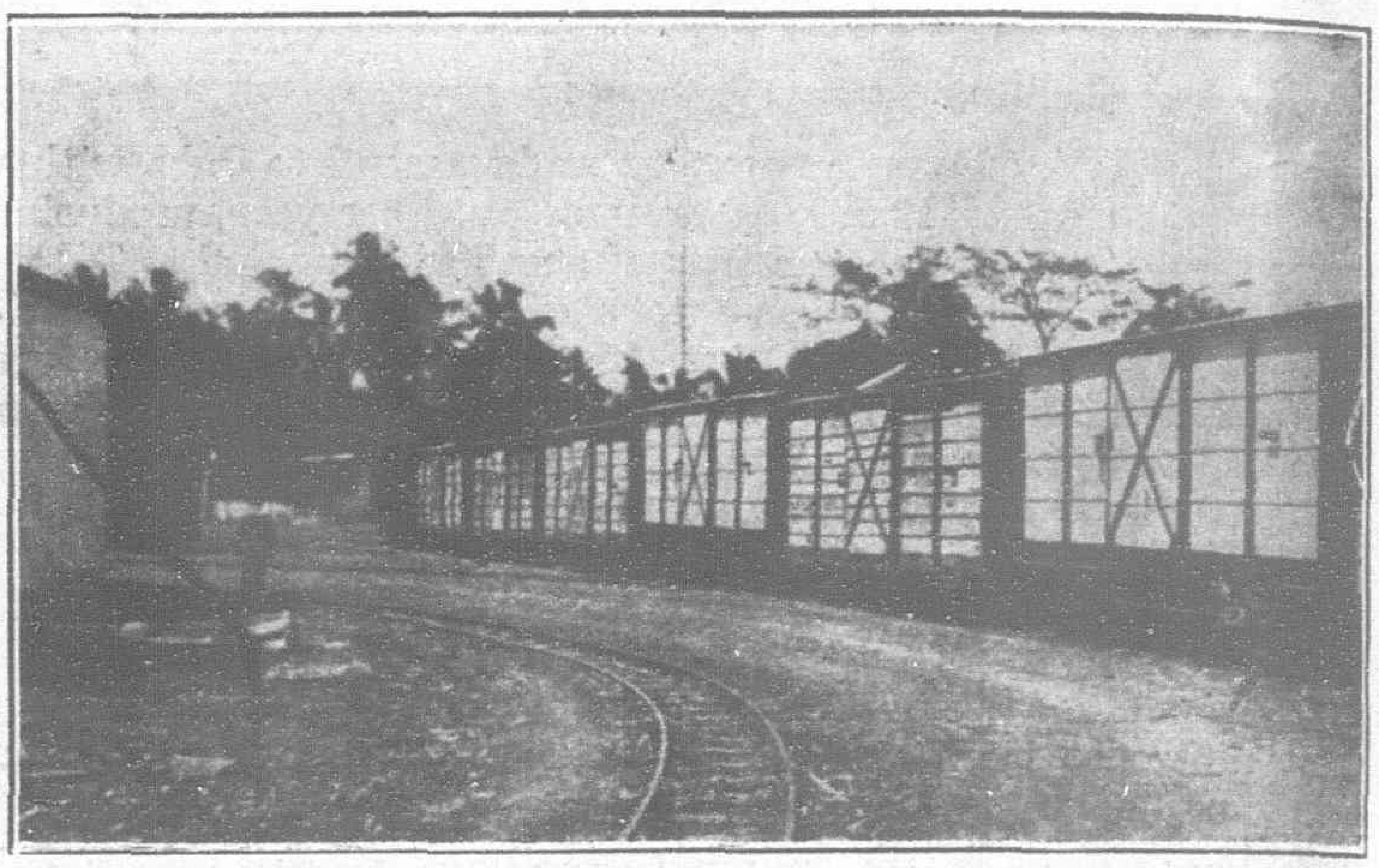
The cane is taken up by the roots and not cut above the ground as in most other cane producing countries.

100 pounds, bound with wire or rattan, the locomotive crew cutting the bales as used. Recently a few presses have been installed for baling ampas in small bales or briquettes suitable in size for passing through the door of a locomotive firebox. The briquettes are made with thoroughly dried ampas, passed through a machine similar to a coal briquettes for the best hard wood.

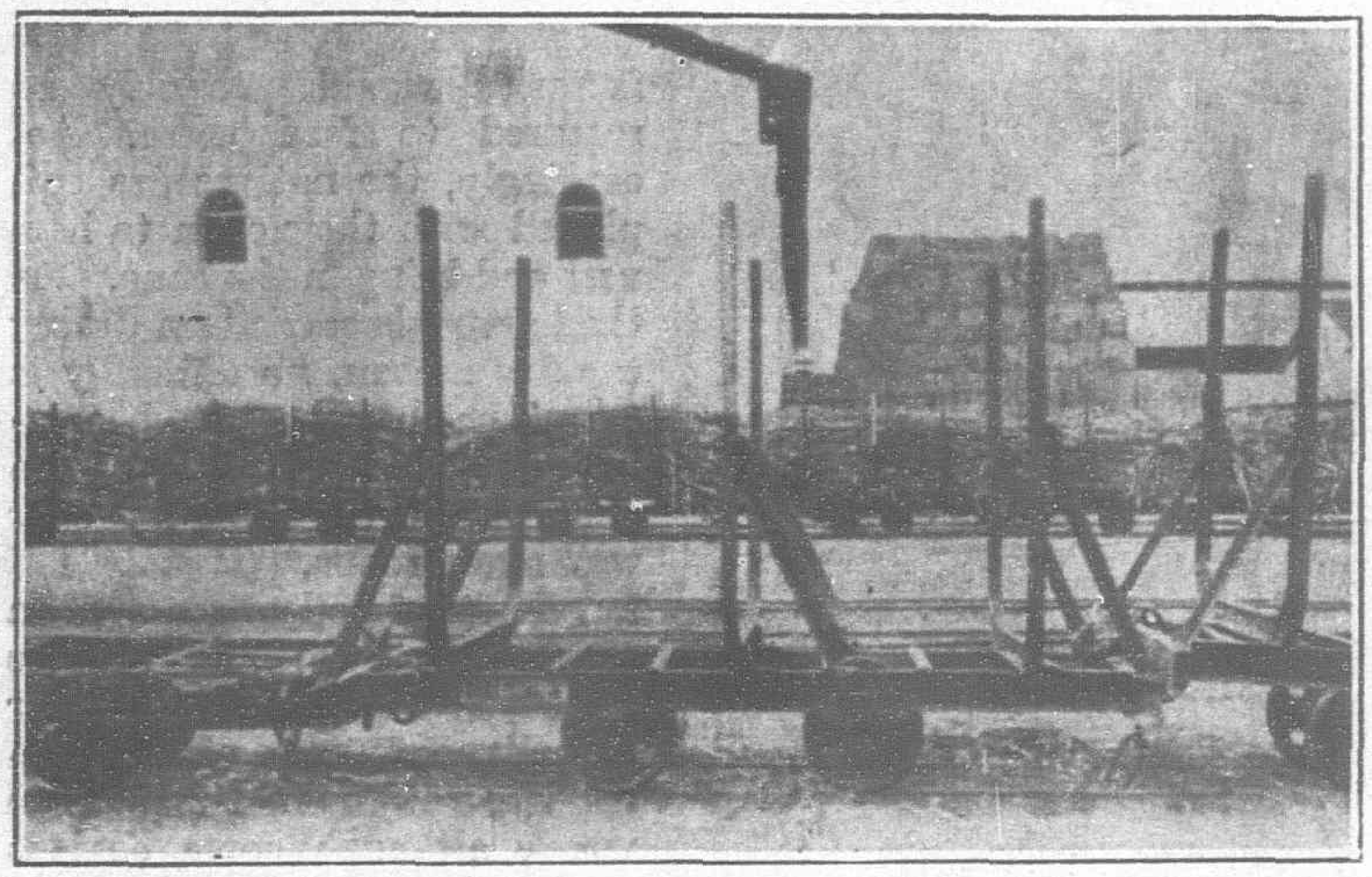
Experimental stations maintained in Java are second to none in the world and carry out a great deal of scientific research and



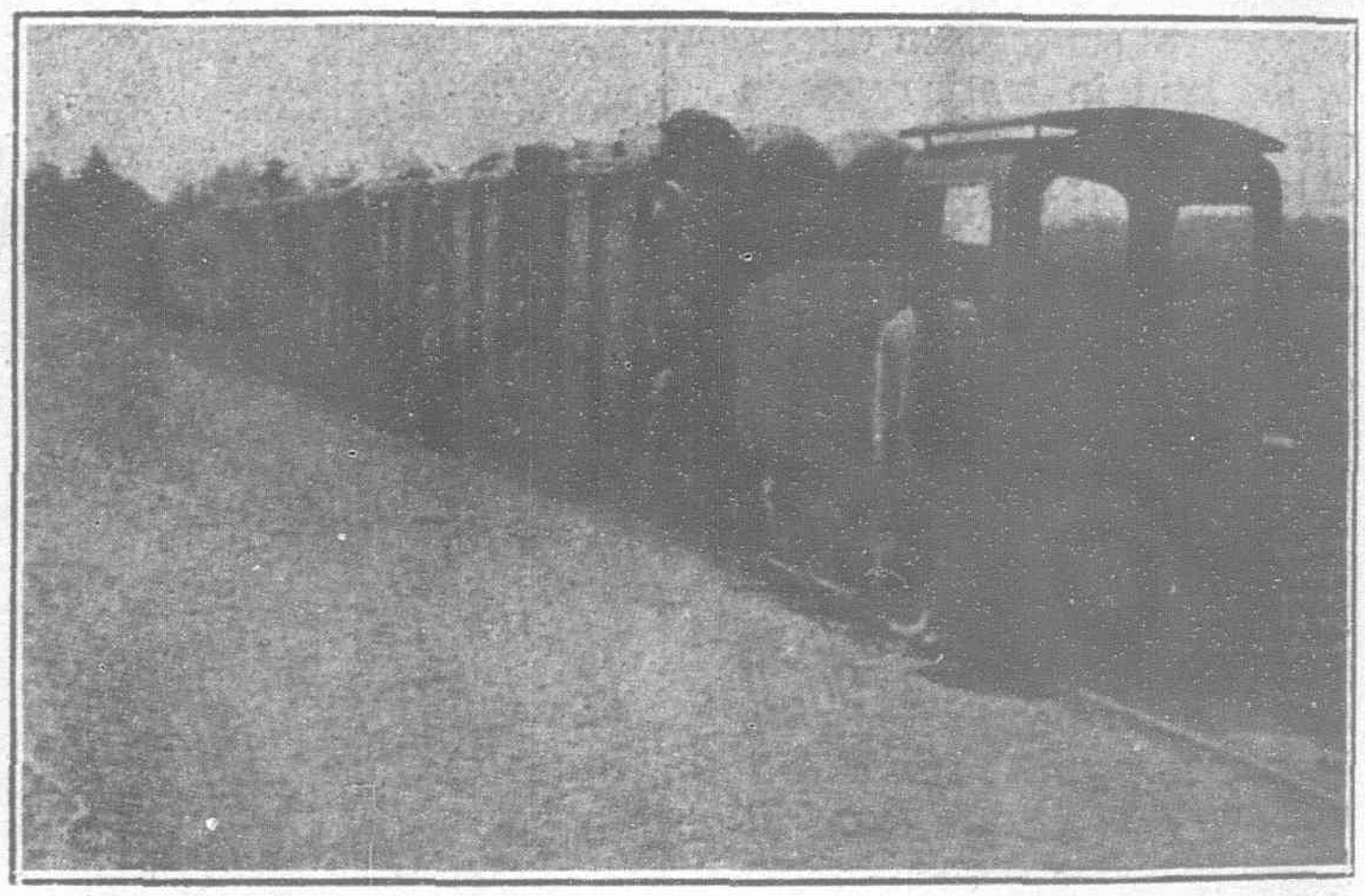
At S. F. Gemoe small wooden cars and cattle are relied upon to keep mill in operation 24 hrs. per day.



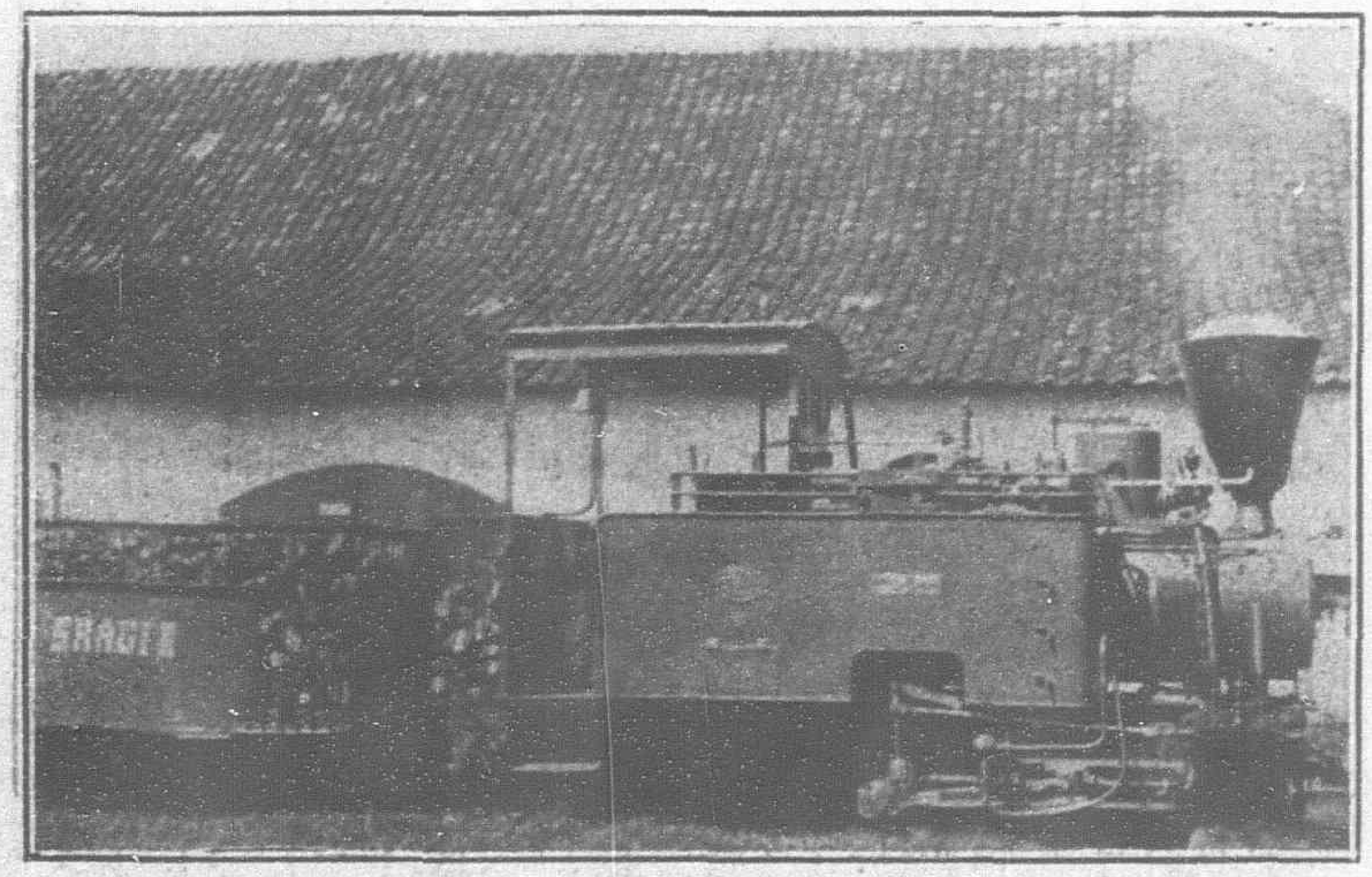
Closed cars for transporting finished sugar. Capacity 10 tons. Gauge 60 cm.



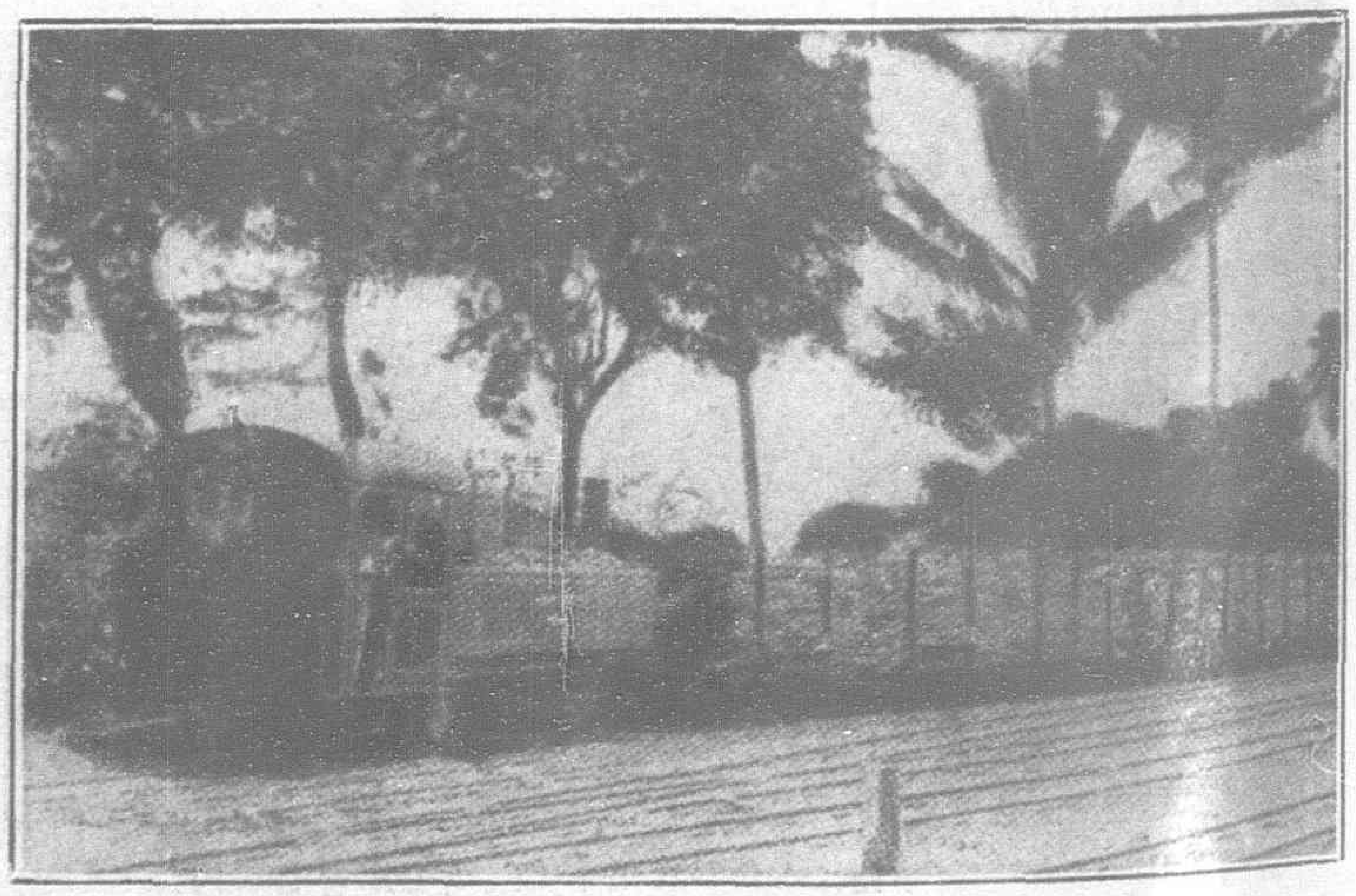
This type of car permits removal of the load of cane in one bundle by an overhead crane, with which most factories are equipped. The pile of blocks in background is baled bagasse.



Small internal combustion locomotives are used by some factories for light transport. In this picture the new cane is just showing above the edges of the furrows.



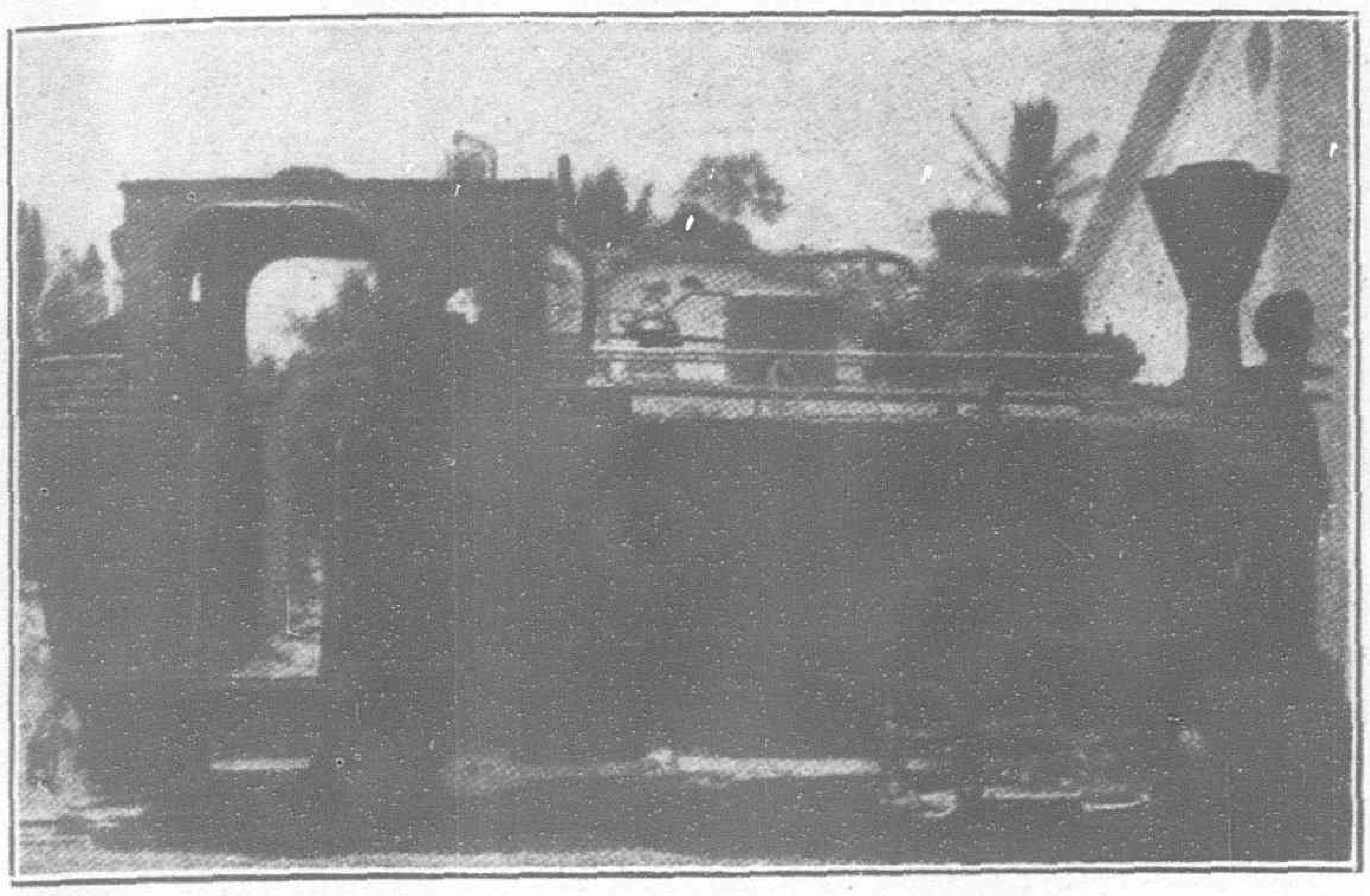
0-4-2 type locomotive rated at 40 h.p. Gauge 60 cm.



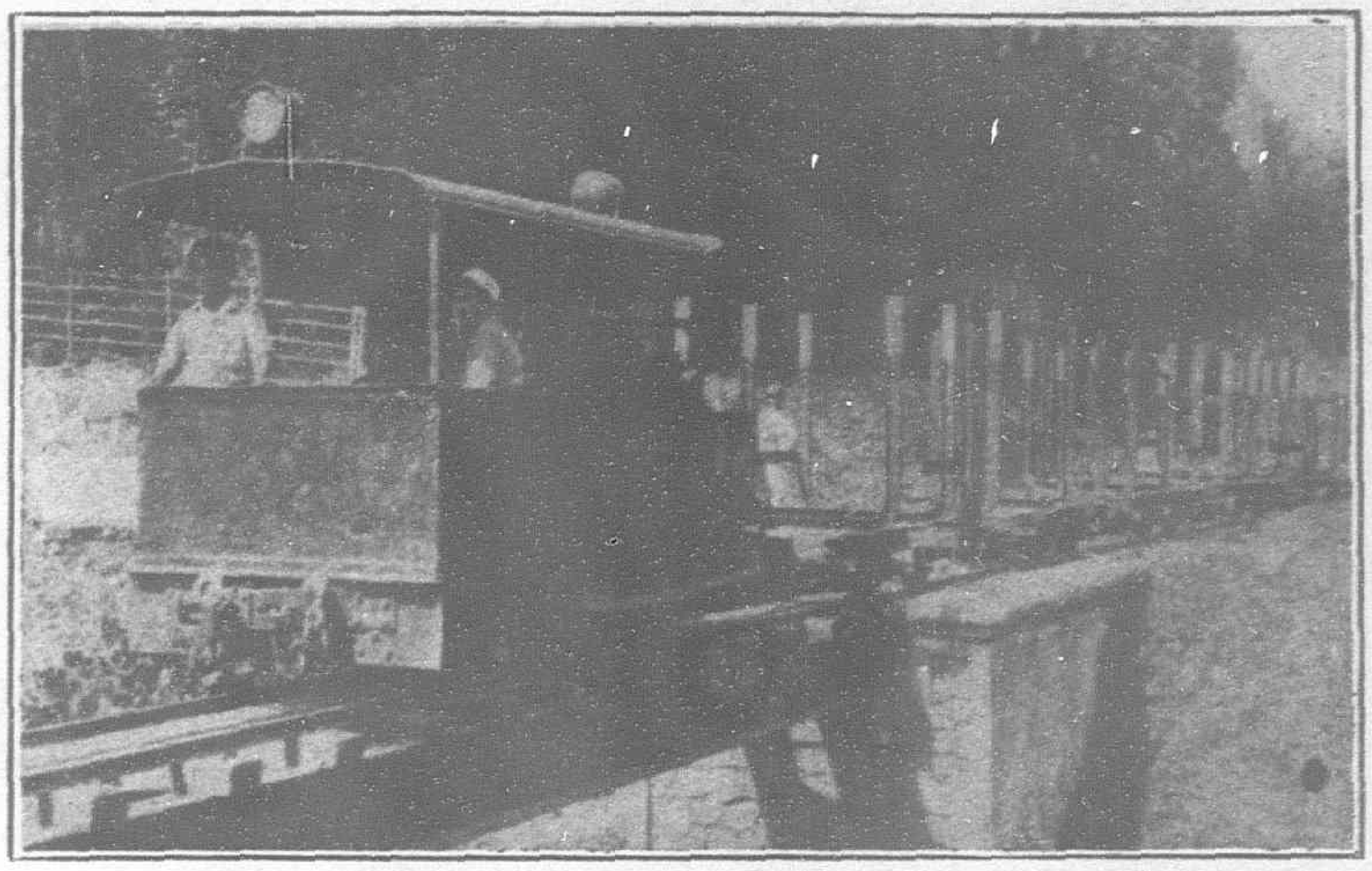
A Baldwin Locomotive at Sugar Factory "Kenongo."

practical application. Relations of the Experimental Stations with the Sugar Factories are well worked out and lead to good field results. The climate of Java is ideal for sugar and the Island highly fertile.

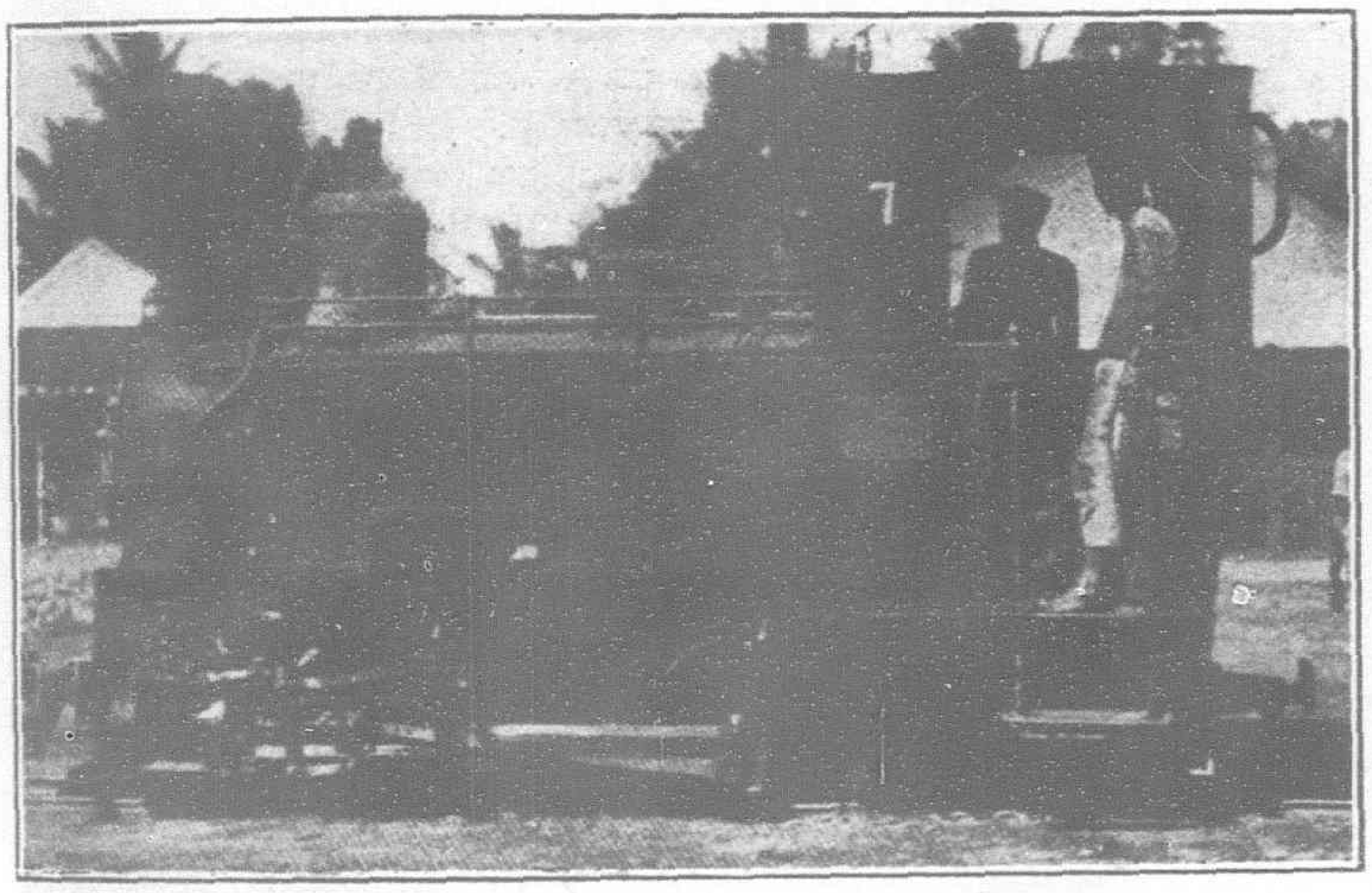
Owing to the numbers of the population and consequent low wages, economic problems encountered by the Dutch in Java are as a rule entirely different from North or South American conditions. It follows that Dutch methods are also quite different from American. Dutch management is practical and economical. It has met with conspicuous success in governing a large Asiatic population and developing a big trade.



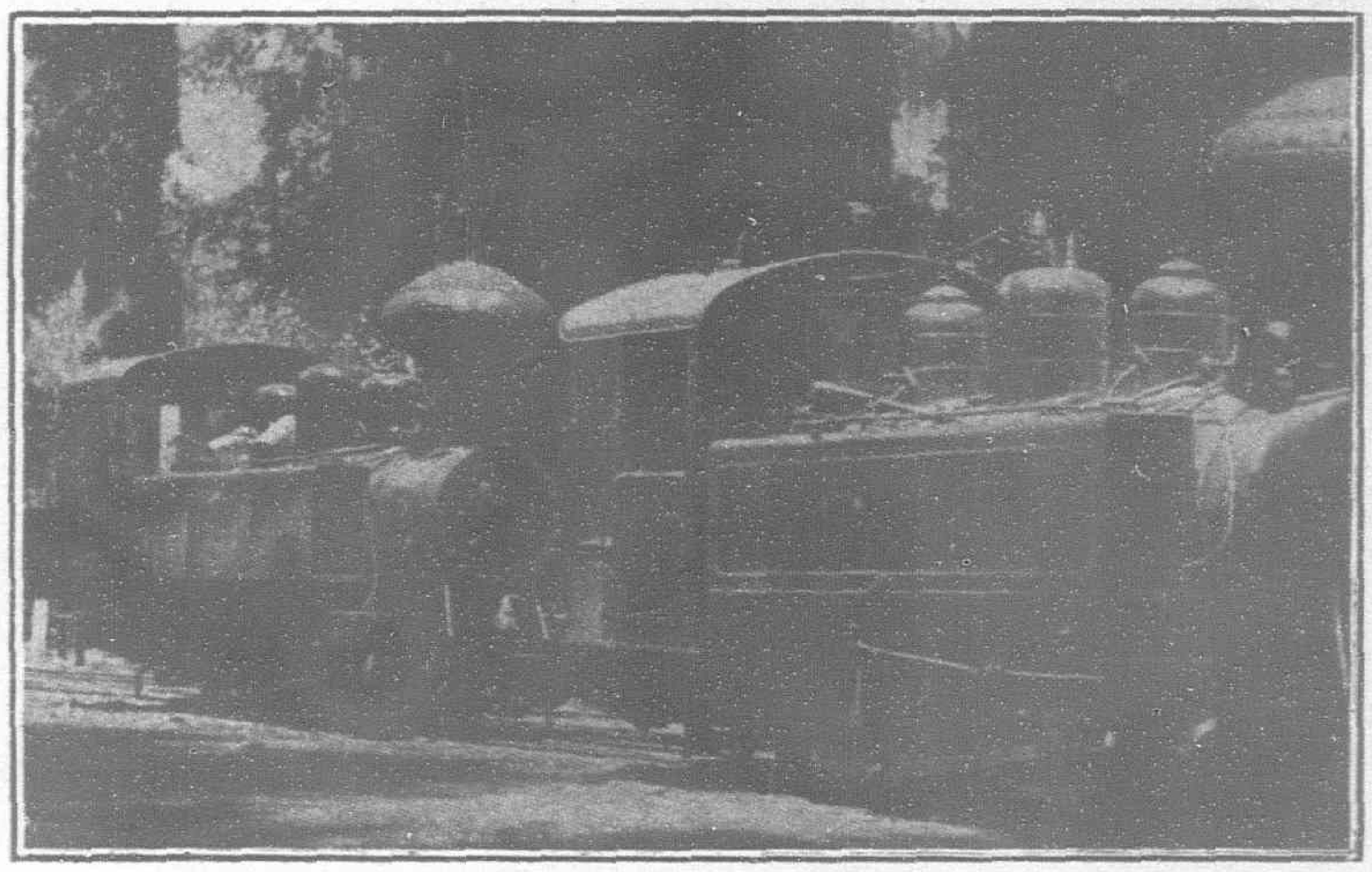
A good example of a Java plantation locomotive of the 0-8-0 type. This small locomotive is successfully burning briquetted bagasse



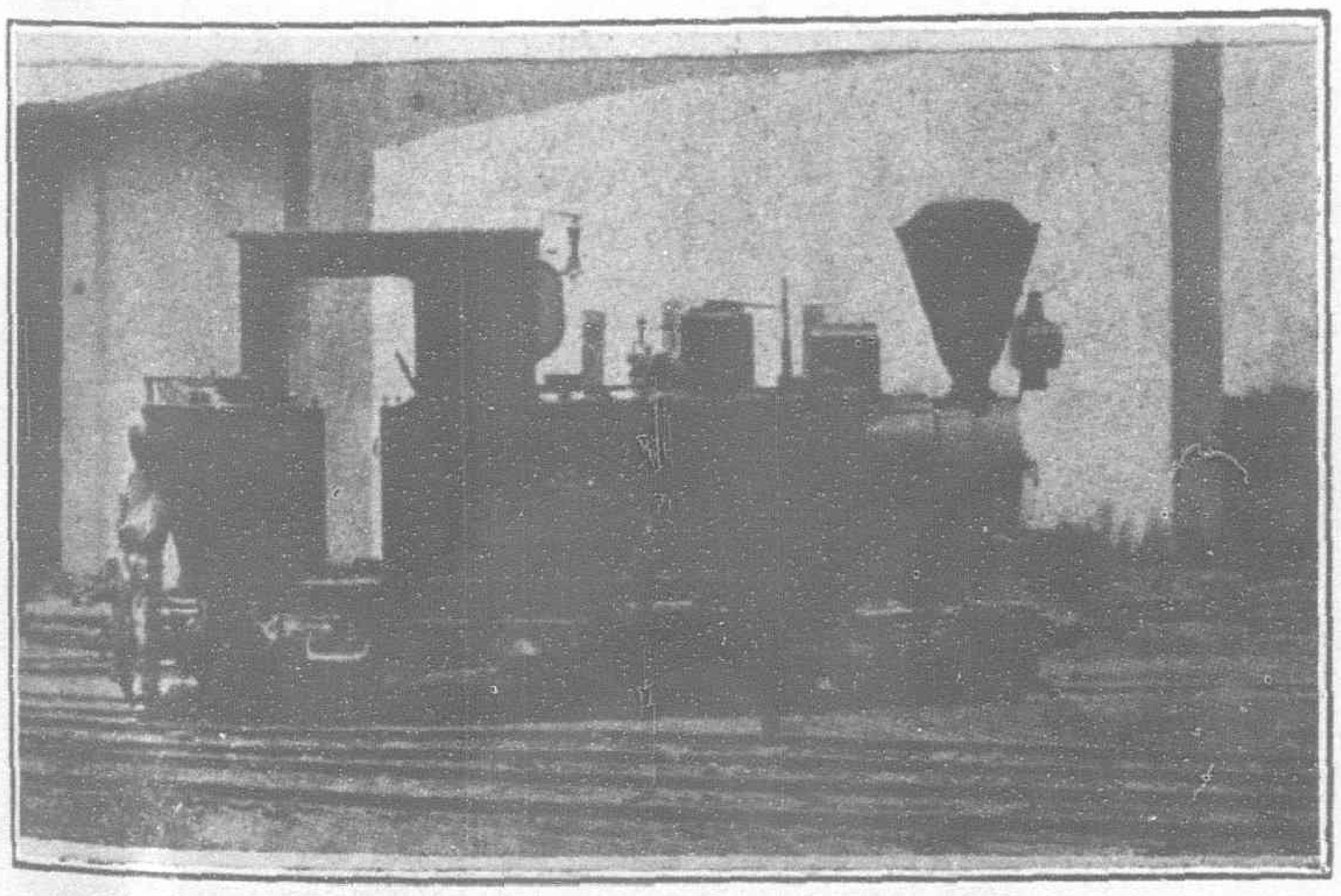
A Baldwin 35 horse-power gasoline locomotive at Sugar Factory "Kenongo." This type of locomotive is at its best in intermittent service.



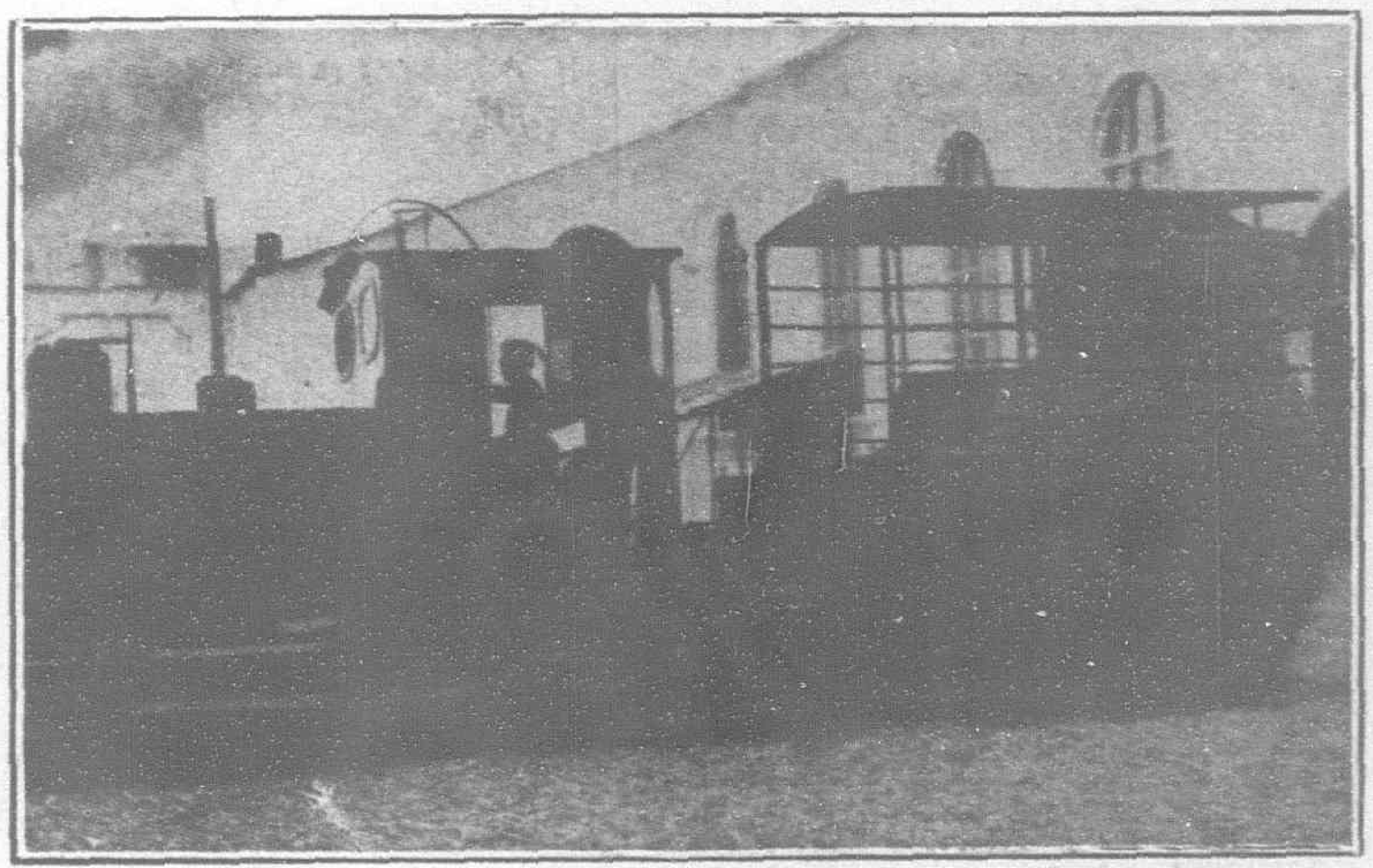
A locomotive of the 0-6-0 type, rated at 60 horse-power.



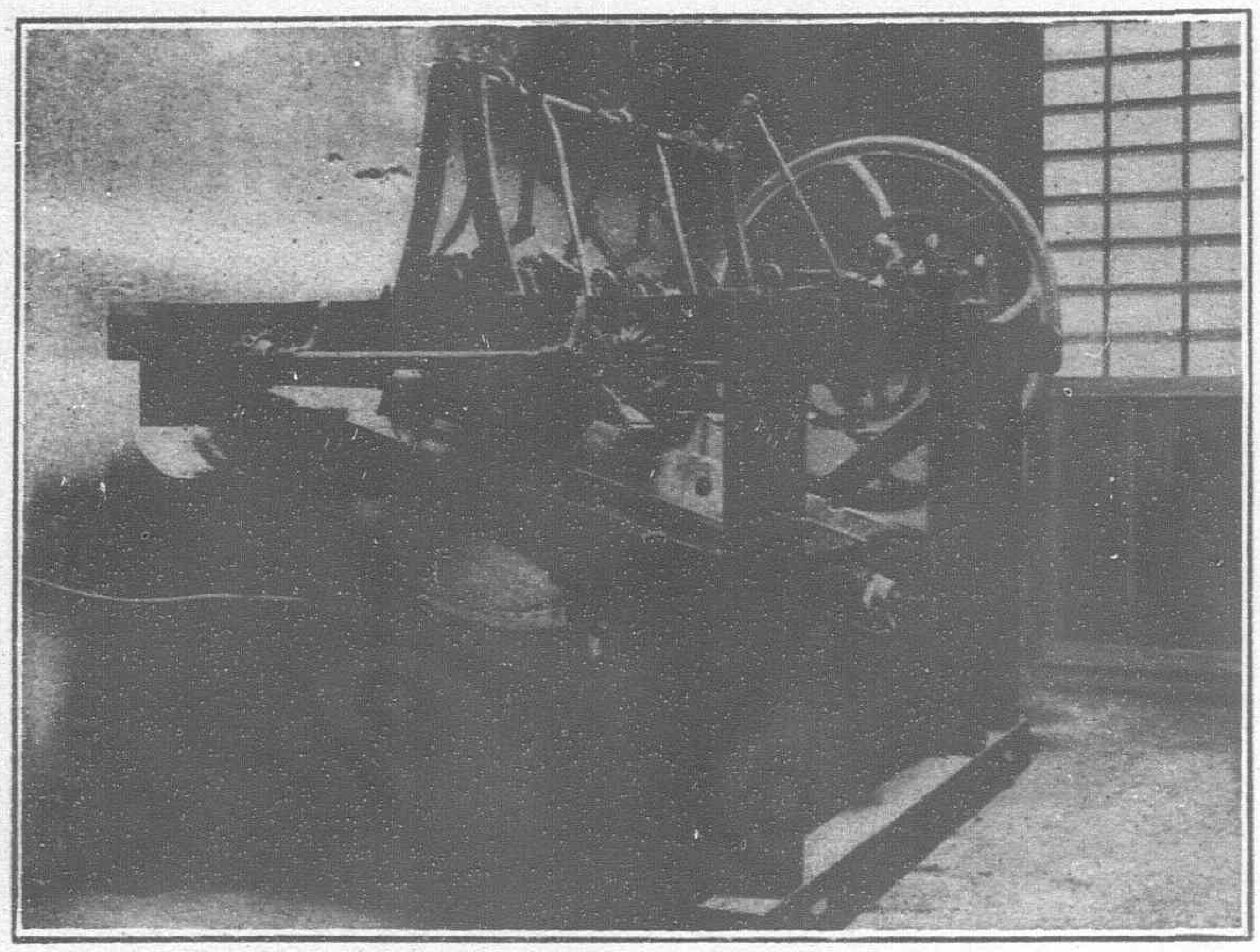
Baldwin Locomotives at Sugar Factory "Soemberdadi."



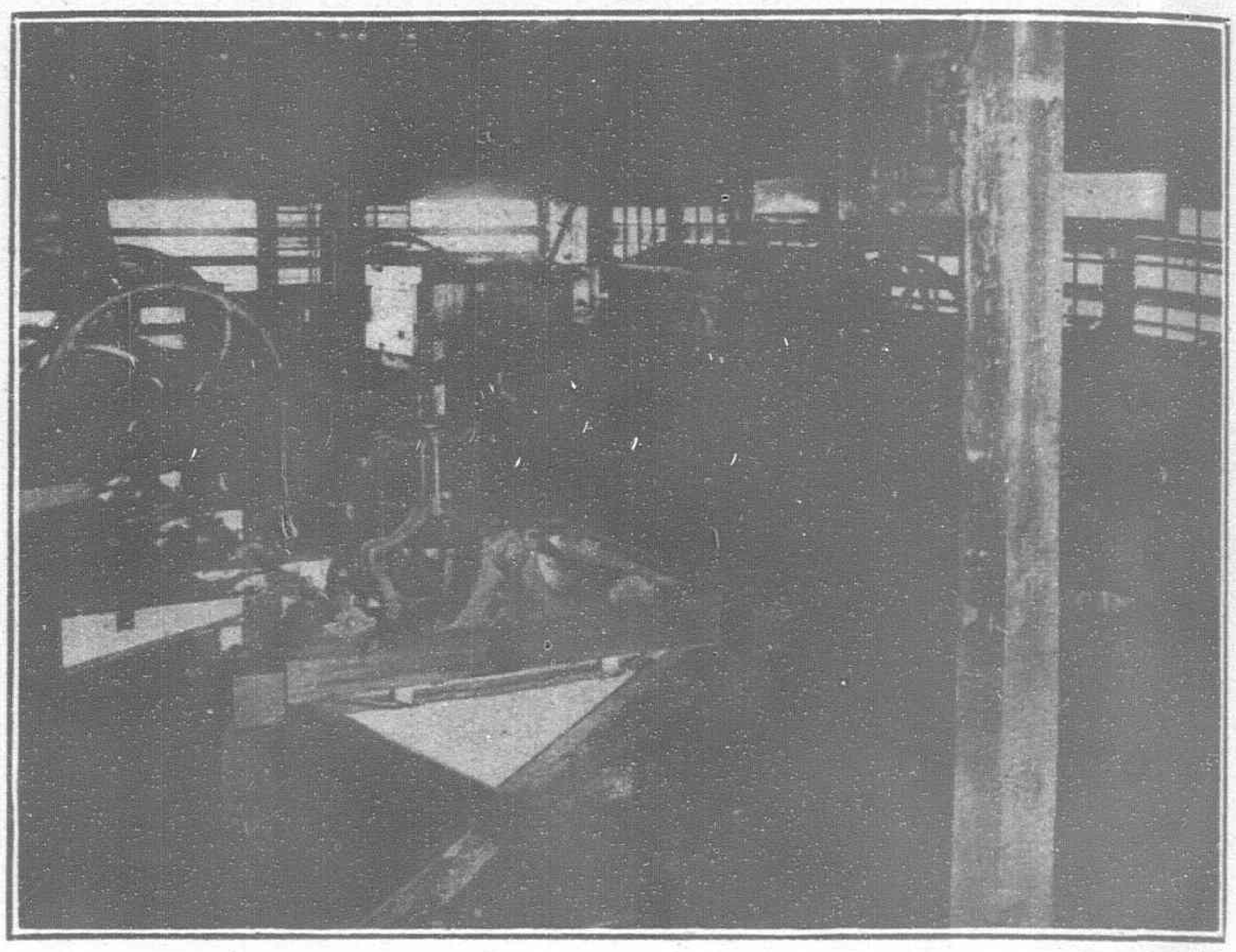
Small Mallet locomotives are used on a number of plantations. They traverse sharp curves better than locomotives with fixed wheel bases.



Locomotive at Sugar Factory "Djombang." Baled ampas is now successfully used by many factories as fuel for locomotives.



1.2 KW. Electric Heater for Re-rolling Machine.

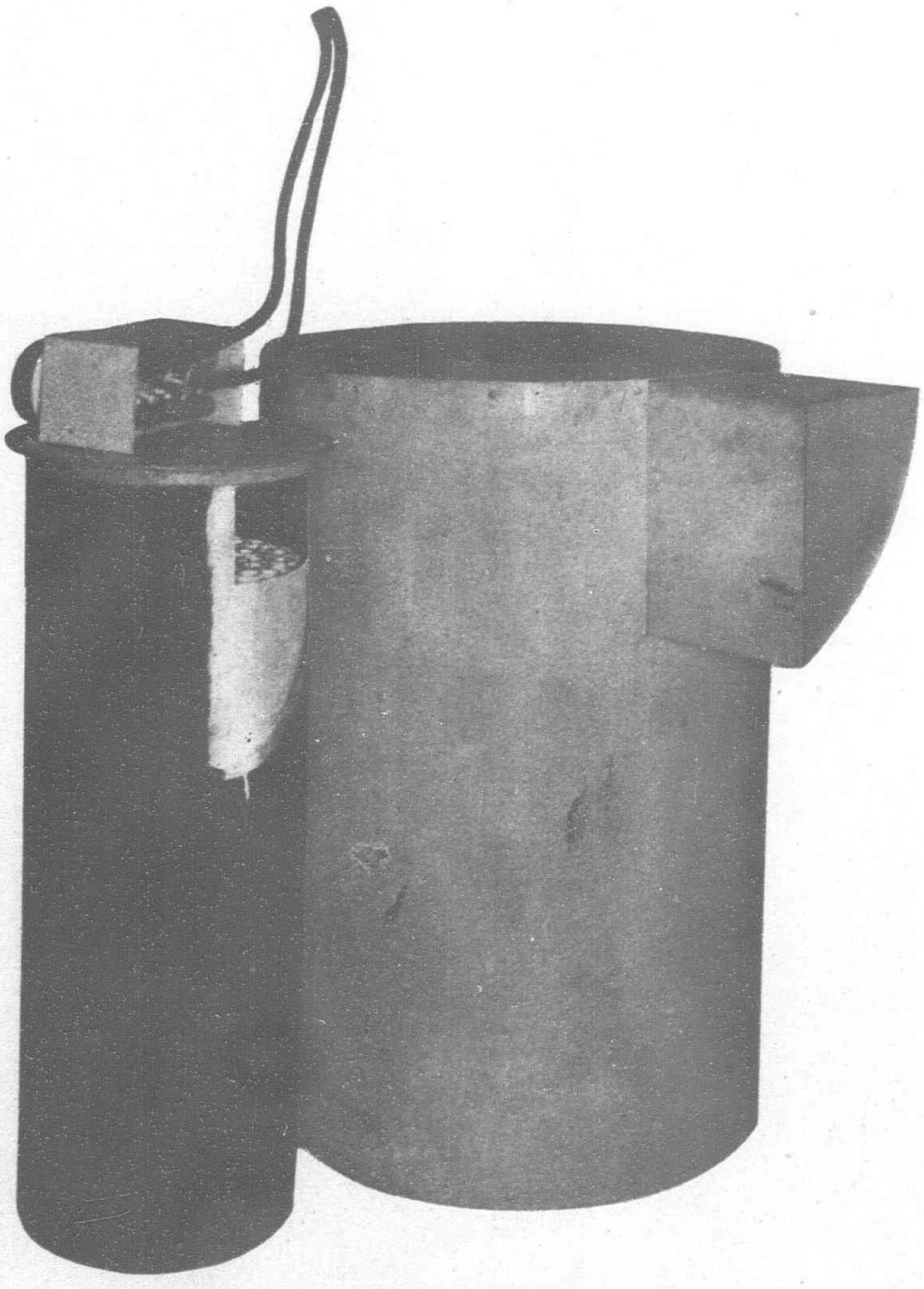


Electrified Re-rolling Machine and Rough Rolling Machine.

Japanese Tea Manufacturing Electrified

THE Japanese tea manufacturers have long been considering to apply machinery in tea manufacturing with a view to effecting increased output at a low cost. After much investigation various machines for tea manufacturing have been invented so that tea is now almost entirely manufactured by machinery in Shidzuoka, the well-known tea district in Japan.

The major portion of Shidzuoka crop which yields an annual production of about 4 million *Kan* (one *Kan* equals to 8.26733 lbs. Avoir.) is exported. The price for the fine quality, produced in this district, is quoted at about Yen 5.50 per *Kan*. In comparison with the annual crop of Miye district as to quantity, Yamashiro yearly yields 500,000 *Kan*, approximately valued at Yen 4,000,000. Yamashiro tea is well-known as Uji tea and enjoys the best reputation for its flavor, it being superior to any other kind produced in other tea districts. Great care is taken in the cultivation and preparation of "Gyokuro," one of the products in Yamashiro district and is therefore costly and quoted at between Yen 20 to 30 per *Kan*. The price of the finest tea which rarely manufactured exceeds sometimes Yen 100.



100 v. 6 KW. Electric Heater for Drying by means of Hot-air Blast used for Rough Rolling Machine.

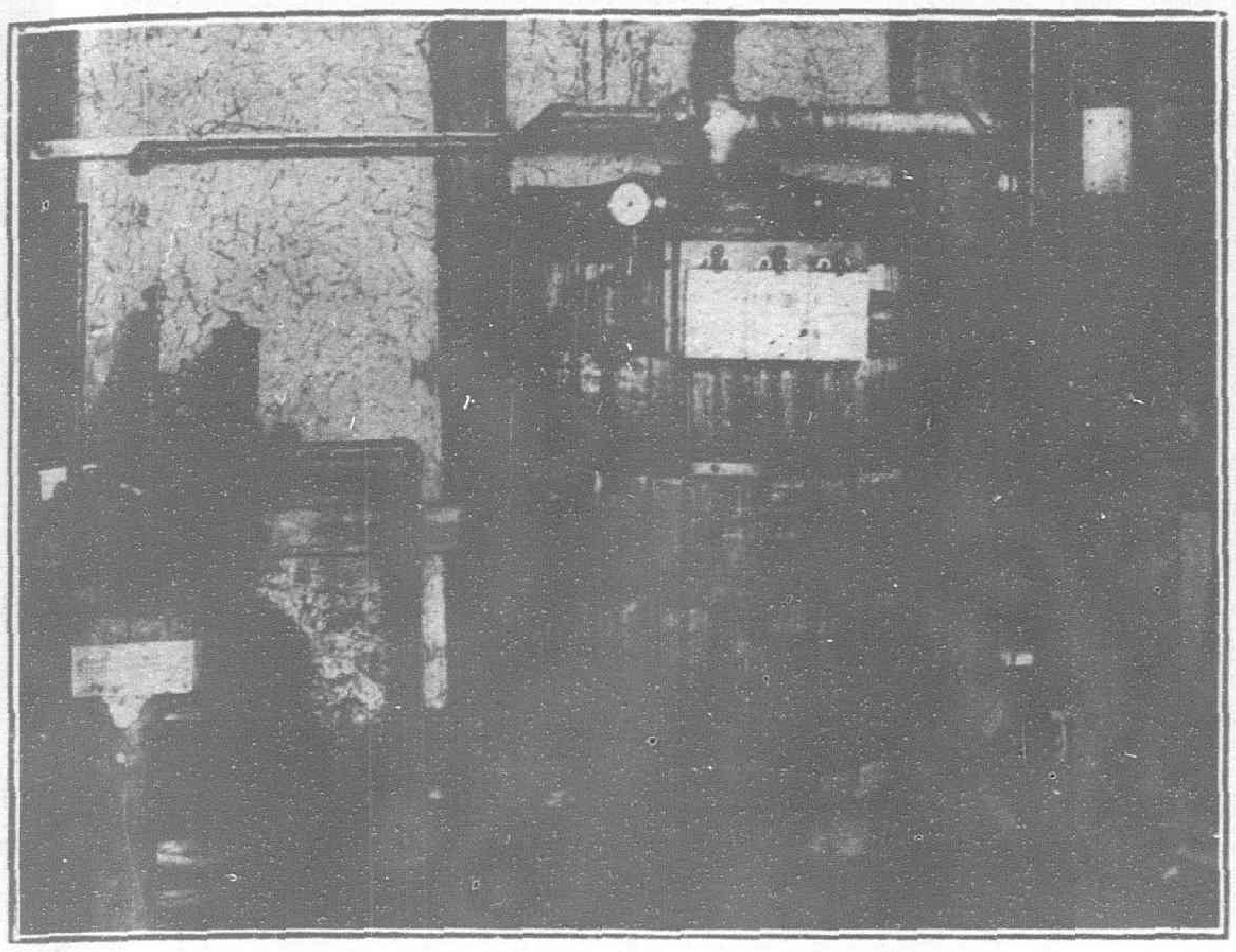
Tea requires a lot of labor, both in its cultivation and its preparation before putting it on market. Hand rolling requires skill on part of workmen who have to work continuously for three or four hours in a room with heat at 100 degrees and full of poisonous fumes from the charcoal fire. On account of this unhealthy condition, the number of workers naturally decreases yearly. Since it is difficult to employ skilled workers for manufacturing tea of fine quality, it is found necessary to prepare tea by means of machinery, use of which for this purpose has been somewhat overlooked hitherto, the general opinion being that machine rolling cannot produce tea of such good quality as is obtained by hand rolling.

One of the tea manufacturers of Yamashiro district, Mr. J. Tsukiyama assisted by an industrial expert, made an experiment on tea manufacturing machines, which are in operation in Shidzuoka district, but without satisfactory results, owing to the irregularity of the amount of heat of charcoal and other fuel used. At the same time, the Kyoto Electric Light Company also made a study on the possibility of using electricity for tea manufacturing. Then Electric Light Company in co-operation with Mr. Tsukiyama decided to use electric heat which proved satisfactory in every respect.

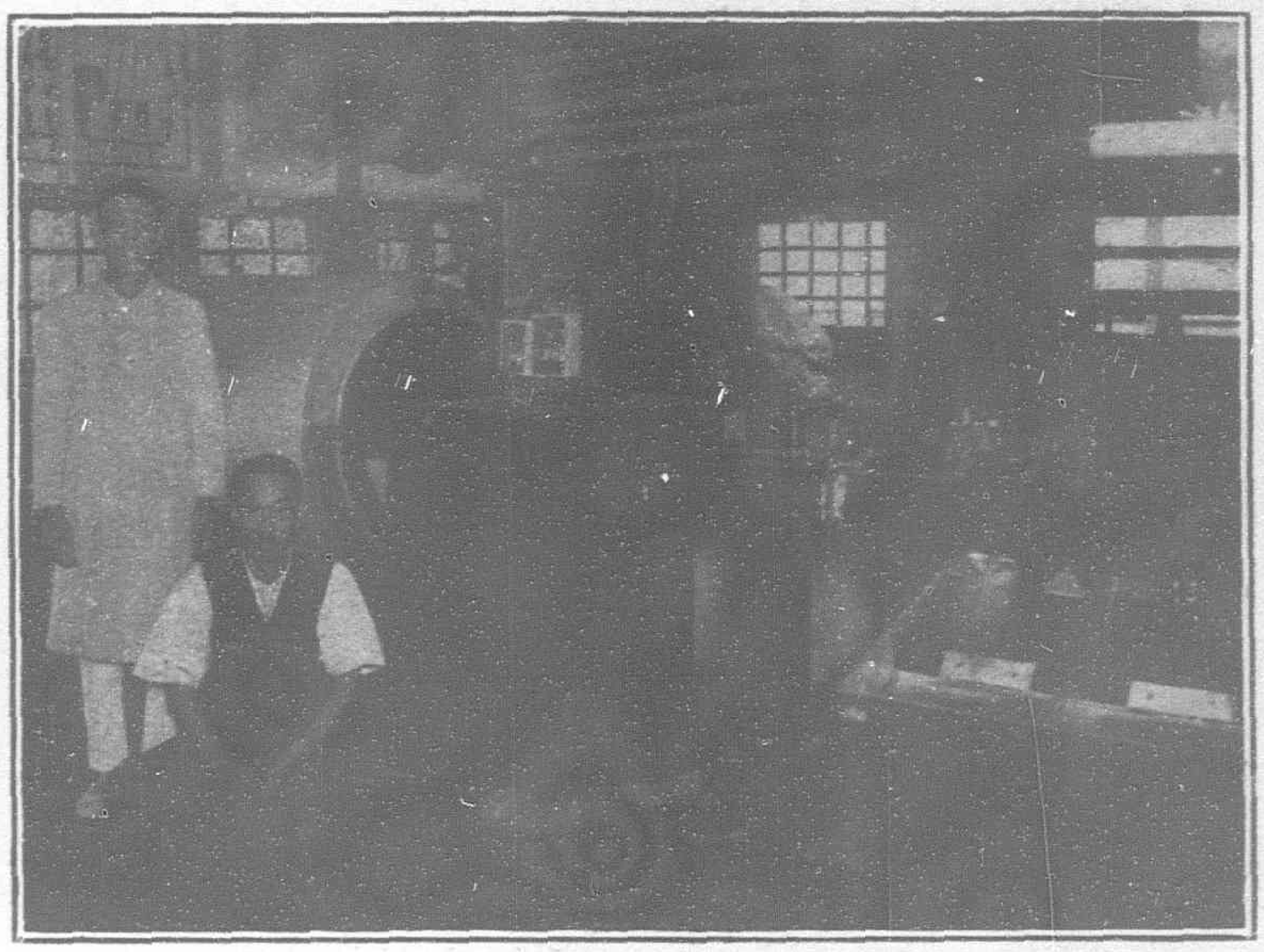
The Benefit of Electrification

The principal advantages for the manufacturing being electrified are as follows:

a. It improves the quality of tea, as no gas is generated. The flavor of the tea is unchanged.



200 v. 3-phase, 18 KW. Electro-heating Evaportation



10 KW. Electric Heater for a Rough Rolling Machine.

b. It reduces the cost of production, as it need not consume much heat and it can save the wages of workmen.

c. It is safe from fire.

d. Even though the factory is small and narrow, it is not injurious to the health of the workmen, as the heat is not from charcoal which naturally generates gas.

e. It can be without any depot for fuel as in the case of charcoal being used, and naturally it can save cost of labor for delivery of fuel.

f. Owing to the fixed amount of heat used, it can be operated to meet with large-scale production.

With the satisfactory result obtained, the electrification of the machinery has passed the experimental stage, and in 1925, electric power as much as 200 k.w., in all was consumed by various manufacturers for the purpose. It is needless to say that the manufacturers who require electric heat for their tea preparation will increase in number year after year.

The Structure of Various Machines for Tea Manufacturing

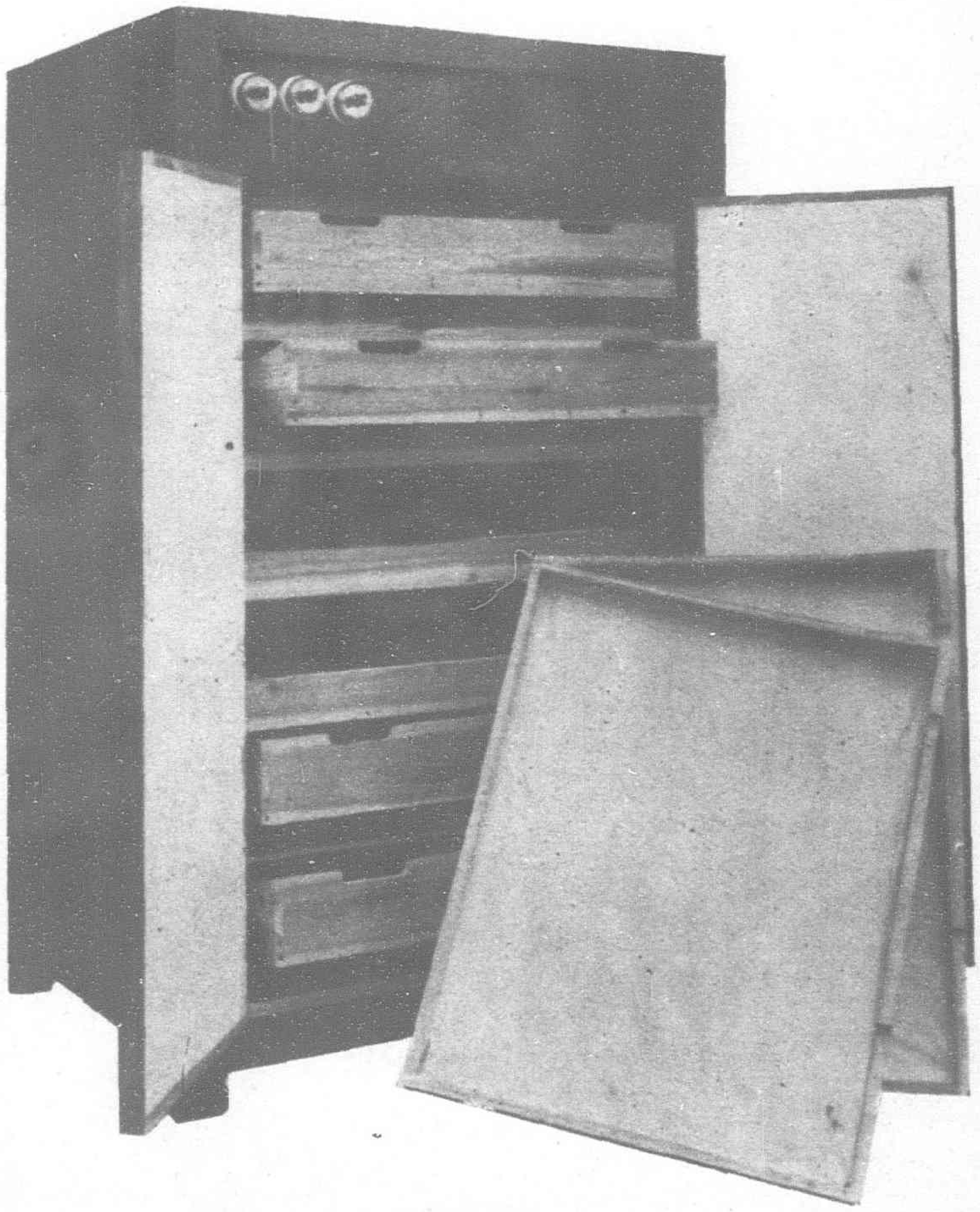
There are many kinds of machines for tea machinery, namely, evaporator for steam oven, rough-rolling machine, re-rolling machine and dryer. By jointly using electric heat, the capacity of these machines can be fully displayed.

Electric Heat Evaporator for Steaming

After tea leaves have been picked, they are subjected to a first treatment—steaming. Then they are rolled. According to the old process, the tea leaves used to be steamed in a steaming basket placed on an oven full of boiling water. However, portable steam heaters are used on tea manufacturing machines. The steam heater is fitted with an endless hurdle which slowly revolves by means of a motor. The hurdle acts just the same as a belt conveyer and while in motion, the tea leaves on it are steamed and then blown off by means of a fan which is fixed at the end of the hurdle.

Electro-heating for Rough-rolling Machine

The steamed leaves are then put in a rough-rolling machine to be roughly rolled. The machines are of various combinations and are operated by motor. A metal roller which acts something like the worker's hand is fixed to the machine, and while in operation, the roller has to be heated by coal or charcoal fire hitherto. But in so doing, the flavor of tea leaves is apt to get spoiled by the gas generated from such fuel. Moreover, as it is not easy to regulate the temperature of heat, naturally, it causes the quality of the leaves to deteriorate. In order to remove these defects, an oven with electric heated air has been adopted.



4 KW. Drier.

Electric Heating Re-rolling Machine

This is the machine for re-rolling the leaves once rolled by means of rough-rolling machine. There are various kinds of thsse machines such as Yagi, Takabayashi, etc. In the Yagi type machine, while in rolling operation, the amount of heat used can be adjusted by either of the machines of different types.

Electric Heating Drier

This is used in two ways: firstly, when the final process of tea manufacturing work started and followed by re-rolling process, secondly, when manufactured tea-leaves are to be dried again in some future time. The tea-heater is square-shaped with six partitions inside and in every partition, heating wire is arranged.

Results of Tea-manufacturing in the Factory with Electrical Equipment

Mr. C. Hayashi's No. 1 factory at Fukakusa Kyoto, Prefecture, has an area of about

138 square yards, but its daily output reaches over 800 lbs. on average. The machines installed in this factory are as follows :

Description	*Type*	*No.*	*Capacity*	*Total Capacity*	*Remarks*
Evaporator		1	18.0 k.w.	18.0 k.w.	
Rough-rolling Machine	Takabayashi	4	10 ,, each	40.0 ,,	3 sets on average in operation
Re-rolling Machine ...	Takabayashi with 3 rollers	2		7.2 ,,	
Drier	Tanita	2	40 ,,	80.0 ,,	1 set in operation
Gross Total				73.2 k.w.	

Mr. J. Tsukiyama's Factory No. 2 at Fushimi, Kyoto Prefecture is famous for its production of " Gyokuro " tea of the finest quality and the electrical machines are provided in order to improve the quality of the manufacture.

The following is the table showing the machines installed with their capacity :

Description	*Type*	*No*	*Capacity*	*Total Capacity*
Rough-rolling Machine ...	Harasaki	2	9.0 k.w. each	18.0 k.w.
Rough-rolling Machine ...	Harasaki	1	6.0 ,,	6.0 ,,
Re-rolling Machine ...	Yagi with 4 rollers	1	6.0 ,, per roller	2.4 ,,
Drier	Tanita	1	3.6 ,,	3.6 ,,
Gross Total				30.0 k.w.

In addition, this factory is equipped with one 1.8 k.w. Drier. During the space of time from May 10 to July 2, 1924, comparison was made between the price of fuel and that of electric heat at Mr. Tsukiyama's factory.

The following is the result :

Name of Machine	Unit	Cost of Fuel			Cost of k.w.	Cost of Electric Heat
		Description	Quantity	Amount		
Rough-rolling Machine	1 " kamme " raw leaves ...	Coal	600 " momme "	7.5 sen	1.7 per hour	8.5 sen
Re-rolling Machine	1 " kamme " manufactured leaves ...	Charcoal	190 ,,	7.6 ,,	0.8	4.0 ,,
Drier	1 " kamme " manufactured leaves ...	Charcoal	70 ,,	2.8 ,,	0.44	2.2 ,,

The following shows the results obtained by Mr. Hayashi's factory equipped with the electrical apparatus in the year 1925.

The first crop which comprises half of " Gyokuro," the finest quality and half of ordinary tea.

Number of days worked : 27 days and nights ; quantity of tea manufactured : 1,500 *kan* ; Price of tea manufacture : Yen 18,750 ; Cost of electric power and wages ; 56 k.w. ; Cost Yen 8.30 ; wages, 1,296.

The second crop tea-leaves are of ordinary tea.

Number of days worked : 11 days and nights ; quantity of tea manufactured ; 700 *kan* ; Price of tea manufactured : Yen 4,900 ; Cost of Electric power and wages : 56 k.w. ; cost 350 yen ; wages, Yen 440.

The following shows the results obtained by Mr. Tsukiyama's factory equipped with the electric apparatus in 1925. The first crop tea-leaves (Gyokuro ") : Number of days worked : 18 ; quantity of tea manufactured : 325 *kan* ; Price of the tea manufactured : Yen 9.000 ; Cost of electric power consumed : k.w. 30 Yen 1924 ; wages : Yen 1,695.

The second crop tea-leaves (ordinary tea) : Number of days worked : 9 ; Quantity of tea manufactured : 106 *kan* ; Price of the tea manufactured : Yen 900 ; Cost of electric power consumed ; k.w. 30 Yen 91 ; wages 124.

a. The evaporator for the steam-heater for making *Gyokuro*, the finest quality of tea and ordinary tea has the following capacities : 10 to 20 lbs. pressure per square inch, water quantity, about 2 *koku*, electric heating capacity, 18 to 24 k.w., and productive capacity, steamable 30 to 40 *kan* of raw leaves per hour.

b. Rough-rolling machine for *Gyokuro* and ordinary tea has the following capacities : The electric heating capacity is 9 kw, but it is reduceable down to 6 kw. with the progress of drying degree. The productive capacity per 12 working hours a day are as follows :

30 *kan* of raw leaves for *Gyokuro*
40 ,, ,, ,, ,, ,, ordinary tea
40 ,, ,, ,, ,, ,, second grade *Gyokuro*
50 ,, ,, ,, ,, ,, ,, ,, ordinary tea.

The capacity of the electric heater for the rough-rolling machine for manufacturing ordinary tea is 12 kw. but it is reduceable down to 6 kw.

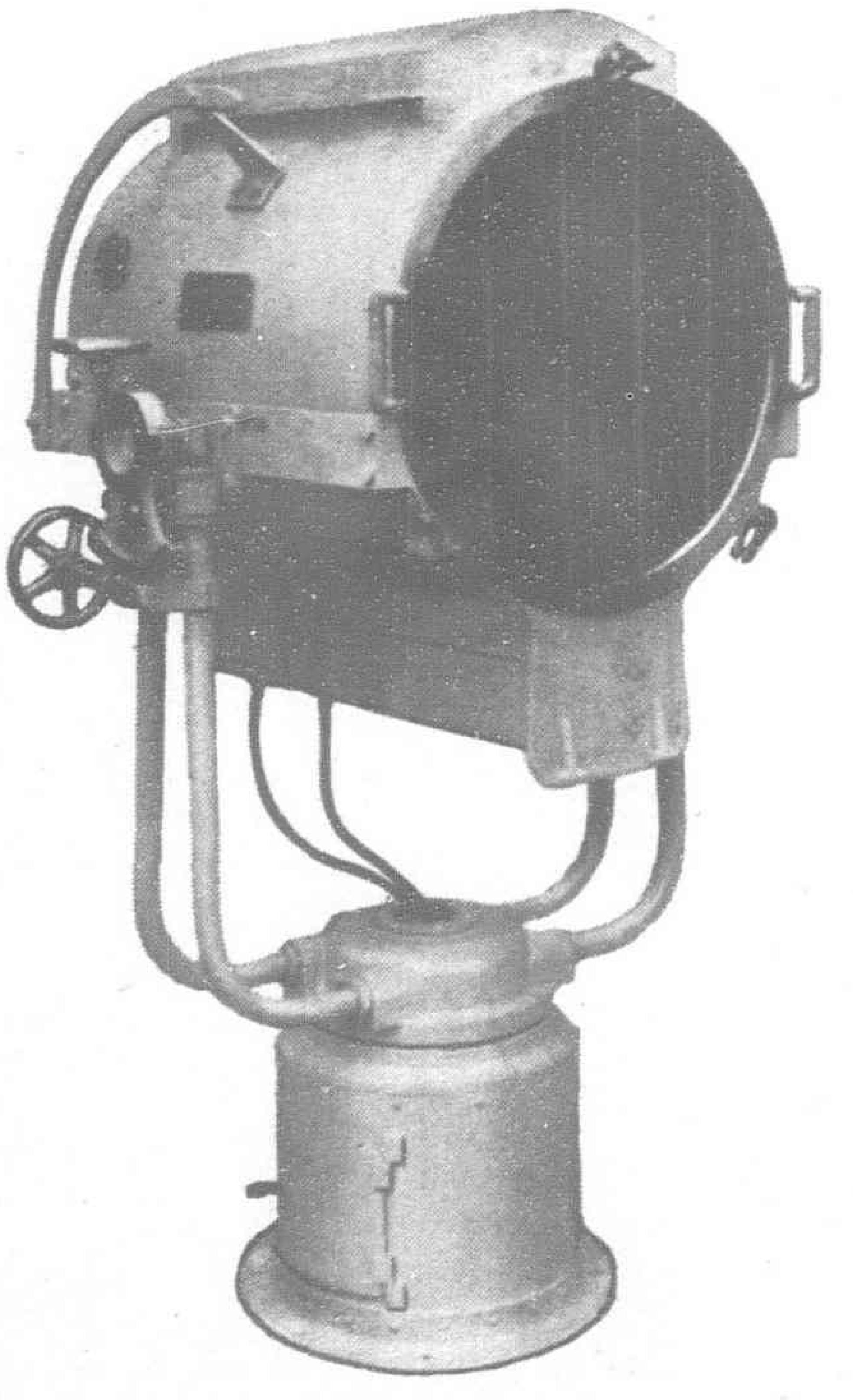
c. Re-rolling machine. The electric heating capacity of Yagi system machine for manufacturing *Gyokuro* and ordinary tea is 600 kw., while that of Takabayashi System is 800 kw. As to the Yagi system machine for manufacturing ordinary tea, the capacity is 800 kw., whereas that of Takabayashi system has the capacity of 1,200 kw. The roller of Yagi system machine is capable to finish as much as the quantity to be finished by one set of rough-rolling machine. Takabayashi system machine is capable to finish the quantity about 50 to 100 per cent. more than that of Yagi system.

d. Tanita System Drier. The electric heating capacity is 4 kw. The drying capacity differs according to the quantity of moisture the leaves contain, and in ten working hours in the day time, it is generally as follows : For drying *Gyokuro* of 15 *kan* 20 kw. electric power is required per hour, while for drying 30 *kan* of ordinary tea, 30 kw. power is to be required.

The special feature of electric heat adopted for tea manufacturing is that the heat is changeless and it can be adjusted according to the requirement. About ten years ago, the Kyoto Electric Light Company, Ltd., started the experiment in order to replace out-of-date machines with the electrical ones, and obtaining satisfactory results in 1924, they recommended the machines to various tea factories in which they are now in operation.

London Electric Firm—Searchlight Specialists

THE London Electric Firm, Croydon, have supplied a further number of Searchlights for use on trawlers, a considerable number of Hand Searchlights for use on Lifeboats made of combined non-corrodible and light metal to withstand sea air and for ease of carrying, this being a very special grade of metal which has been evolved by long experience to overcome the draw-back associated with this class of material in the past viz. that it corroded in the presence of sea air.



A London Electric Firm Searchlight

Further, they have made some Searchlights for the modern large Motor Lifeboats, these being of special construction to meet the exacting conditions applicable to such boats. They have also made Searchlights for Yachts both of the electrical and acetylene variety; also for Revenue cutters for abroad, as well as some combined hand and stand Searchlights ; with the usual run of Pilot House Control and Suez Canal Projectors ; as well as Daylight Signalling Searchlights with flashing shutters ; also a Projector for *s.s. Helder* which vessel perhaps you can locate as we have no further particulars of it ourselves beyond the fact that the Searchlight was sent to Hull for shipment per this steamer.

Machinery Markets of Netherlands East Indies

By J. F. Van Wickel, American Trade Commissioner, Batavia

Extent and General Characteristics of the Market

IN studying this territory one finds a situation different from any existing elsewhere in Asia, for the industries in the Netherlands East Indies are much older than those in other Asiatic countries. Sugar is the outstanding product of Java, and as long ago as 1894 the area planted was about 300,000 acres and the yield 2.81 tons of sugar per acre. The mere fact that such figures exist demonstrates that some good scientific work was in hand as far back as the Japan-China war and the days when American influence was first being felt in the Philippines. The cotton-spinning industry was then very young in Japan and had not developed very far in India. The first Government railway in Java was opened to the public as long ago as 1878. Consequently the mechanical era in Java goes well back into the nineteenth century, and the returns showing the imports of machinery have a correspondingly different significance from those applying to the other countries that have been opened up more recently.

Also, in those nineteenth-century days we had very little contact with engineering in the Netherlands or that in the East Indies, with the result that one sees almost no trace of American influence in the engineering works that have been built in Java. This is undoubtedly unfortunate for Java, as the world in general recognizes the superior qualities of American engineering and one gathers the impression that these works might be greatly improved. However, during the war large quantities of American machinery were imported into the Netherlands East Indies, and with this introduction it was hoped that American methods and designs would thereafter be appreciated and adopted. Such did not prove to be the case, for various reasons which will be touched upon later, especially in the section on " Sales problems."

Imports of all Commodities by Countries of Origin

It is difficult to present a concise statistical statement illustrating the possibilities of this market, but it will help somewhat to consider first the total volume of the imports of all commodities into the whole archipelago, noting the percentage supplied by the different countries. The following statistics do not include gold or silver imports nor any goods for the account of the Government of the Netherlands East Indies. The total purchases of the principal Government departments of the Netherlands East Indies amounted to 9,388,500 guilders in 1923 and 17,619,600 guilders in 1924.

TOTAL IMPORTS INTO NETHERLANDS EAST INDIES.

[Values expressed in thousands of guilders; par value of guilder, $0.402]

Countries	1910	1911	1912	1913	1914	1915	1916
Netherlands ...	96,449	109,793	129,879	145,259	124,070	99,902	90,771
Great Britain ...	40,628	55,349	63,561	76,571	70,311	79,922	84,651
Germany ...	12,492	16,145	20,665	28,776	21,759	4,302	842
United States ...	5,200	5,561	7,203	9,033	9,693	15,058	30,801
British India ...	35,020	43,276	37,276	22,746	15,153	16,235	27,136
Singapore ...	62,761	66,611	60,555	67,847	58,923	66,087	76,507
Japan	3,139	3,731	4,901	6,769	6,591	12,810	27,238
Other	59,269	58,498	55,103	79,682	76,650	78,002	64,849
Total ...	314,958	358,964	379,143	436,683	383,150	372,318	402,795

Countries	1918	1919	1920	1921	1922	1923	1924
Netherlands ...	11,355	83,359	263,049	269,742	156,217	128,678	132,356
Great Britain ...	78,630	90,860	206,070	144,353	101,883	92,321	99,058
Germany ...	477	957	36,748	56,851	45,904	48,588	46,610
United States ...	62,440	130,487	162,861	108,810	31,944	34,079	44,799
British India ...	32,791	16,205	17,717	38,763	26,971	29,400	36,878
Singapore ...	134,113	132,191	125,424	134,417	95,354	98,330	109,732
Japan	114,580	77,075	134,137	86,095	57,494	49,693	67,062
Other	94,569	106,922	170,207	238,823	175,322	130,998	141,774
Total ...	528,955	638,056	1,116,213	1,077,854	691,089	612,087	678,269

It will be observed that before the war about one-third of all the imports were from the Netherlands. If shipments via Singapore are credited to Great Britain another third was from the United Kingdom. Germany does not occupy a very important position, but this again raises the question of trans-shipment, for German goods shipped via ports in the Netherlands, Great Britain, or the Far East would be credited to the last port of shipment. German participation in this trade was probably larger than these figures indicate. During this pre-war period shipments direct from the United States did not exceed 2 per cent. of the total. It is not possible to estimate what volume might have been trans-shipped, but the impression one receives in Java is that the United States did almost no machinery business with the Netherlands East Indies up to 1914.

The war had a marked influence on this trade. German goods disappeared. British direct trade was well sustained, if measured in money values, but probably fell off considerably if measured in tons. British goods via Singapore probably did not decrease. Direct shipments from the United States and Japan increased rapidly, but it will be noted that the American share during the war never exceeded 13 per cent. Experience since the armistice is self-explanatory, except that one should remember that in 1919 Java had a " seller's market " and American goods were among those that could be obtained.

The relatively small extent of American influence in the total import trade of the archipelago suggests that, as a people, we have been neglecting a very good market. The above figures do not present a very clear view of the American position in the machinery trade, but such figures will appear hereafter. It is apparent that American business in the East Indies needs to be put upon a better basis. This subject is discussed in the section headed " Sales problems."

Growth of the Machinery Market

According to the official " Abstract tables of imports and exports of the Netherlands East Indies," total imports under the general head of " Apparatus, machinery, tools, and instruments, including sewing machines and belting of all kinds,"* between the years 1880 and 1905, in thousands of guilders, were as follows: 1880, 3,295; 1885, 3,561; 1890, 4,136; 1895, 3,875; 1900, 11,307; 1905, 11,526.

Imports for the years 1910 to 1924 were as follows:

MACHINERY IMPORTS OF THE NETHERLANDS EAST INDIES

[Values in thousands of guilders]

Item	1910	1913	1914	1915	1916
Sewing machines	997	1,722	1,402	1,516	1,396
All other machinery, etc. ...	15,819	33,162	25,468	16,620	20,399
Total	16,816	34,884	26,870	18,136	22,214

Item	1917	1918	1919	1920	1921	1922	1923	1924
Sewing machines ...	2,396	1,796	2,399	3,240	1,958	2,040	2,052	1,611
Belting, leather ...	645	1,346	959	1,160	735	490	954	846
Belting, other kinds	496	974	1,129	827	580	459		
All other machinery	21,261	18,481	56,563	72,993	106,562	41,669	29,066	39,210
Total	24,798	22,597	61,050	78,220	109,835	44,658	32,072	39,210

From these statistics one may read the story of a normal, healthy growth of the machinery trade in the colony from 1880 to 1913. During the first half of 1914 this growth continued; but the outbreak of the World War, with its attendant dislocation of world shipping, caused a serious drop in imports during the last half of the year, and the total for that year showed a decline in volume. The year 1915 witnessed the establishment of direct shipping between the colony and the United States, as well as a considerable increase in the value of American machinery imported into the colony, but the total imports for the year declined still further.

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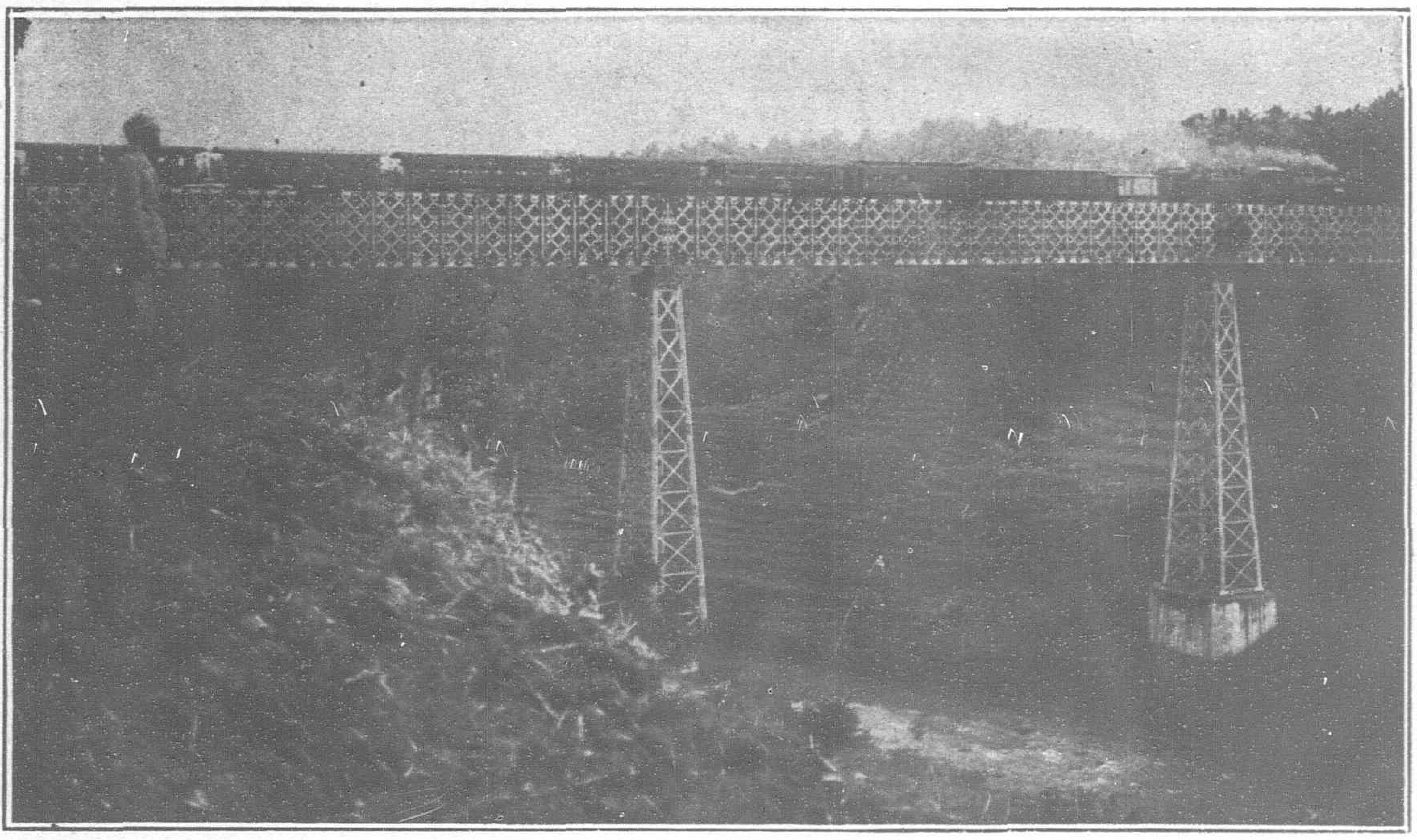
*No subclassifications under this general head are given in the "Abstract" prior to 1910.

While the years 1916 and 1917 showed increases in values, it is doubtful if the volume by weight represented any increase, for the reason that world prices were on the ascendencyduring this period. (Statistics were kept only in values.)


Railway Bridge over Tjitandoej near West Java.

Machinery imports for 1918 showed a decline in value from the previous year. This was largely due to the continuance of the war and to the fact that equipment which had been available from the United States during the four preceding years became more difficult to secure when America entered the war. Then, too, there were the increasing difficulties attending the export of machinery from other manufacturing countries. The decline in volume, because of the continued raise in first costs, was probably much greater than that shown by statistics. However, from 1919 to 1921 both volume and values showed rapid increases. The years 1922, 1923, and 1924 show the result of the depression which set in during 1921 and from which the machinery trade of the Netherlands East Indies has only recently emerged.

The recent depressed condition in the machinery trade was probably due as much to an excess of stocks in the hands of Government enterprises, estates (especially sugar), and other industrial enterprises, as it was to overstocks in the hands of dealers themselves.

Classification Covering Industrial Machinery

A question as to what classification really covers industrial machinery arises when one refers to the import returns published by the Government of Netherlands East Indies. Such parts of the returns as seem related to this subject are reproduced in the following table, and in presenting these figures an effort has been made to translate carefully the different headings. Unfortunately, it is never possible to do this perfectly, for Americans do not ordinarily give these words the exact meaning conveyed by the original. Our interest is confined to the first two classifications, as the investigation represented by this report did not include the market for sewing machines, hand tools, or agricultural implements. There is a possibility that the third and sixth items may include some machinery, but these classifications were not employed prior to 1915. The imports into Java and Madura have been as follows :

IMPORTS INTO JAVA AND MADURA

Classes	1911 *Guilders**	1912 *Guilders*	1913 *Guilders*	1914 *Guilders*	1915 *Guilders*	1918 *Guilders*
Power generating machinery†	9,994,991	13,845,151	19,128,807	14,058,844	3,201,834	2,727,098
Machines for sugar factories	4,813,079	5,749,459	5,780,205	4,015,463	3,124,191	987,000
Mechanical apparatus not elsewhere classified	—	—	—	—	1,236,150	2,636,153
Sewing machines	678,328	1,498,784	1,091,104	744,492	994,590	1,301,865
Agricultural tools	—	—	—	—	1,220,112	1,300,055
Hand tools and professional instruments	—	—	—	—	807,105	910,635
Other machinery and tools, not elsewhere classified	—	—	—	—	2,203,959	3,577,719
Classes	**1919** *Guilders*	**1920** *Guilders*	**1921** *Guilders*	**1922** *Guilders*	**1923** *Guilders*	**1924** *Guilders*
Power generating machinery†	11,475,212	14,524,921	26,232,487	10,846,239	6,418,158	5,934,958
Machines for sugar factories	4,683,343	5,320,839	17,025,904	10,461,447	6,226,451	7,829,233
Mechanical apparatus not elsewhere classified	6,928,343	5,926,638	4,584,756	332,364	225,421	119,369
Sewing machines	1,892,250	2,193,534	1,440,660	1,486,420	1,501,125	831,902
Agricultural tools	1,933,155	3,443,471	2,928,588	679,512	918,668	800,920
Hand tools and professional instruments	2,969,263	5,371,917	3,285,530	1,435,033	1,212,297	1,203,415
Other machinery and tools, not elsewhere classified	10,052,633	15,204,704	18,624,943	7,788,713	6,916,794	9,478,274

*The guilder has a par value of 40.2 cents.

†" Factory and steam machinery " through 1914 ; " Driving machines of all sorts " up to and including the year 1922 ; in 1923 and 1924 includes electrical machinery, nondriving.

In addition to the information given in the foregoing tables some further particulars regarding this trade can be derived from the detailed statements published by the Governments of the United Kingdom, Japan, and the United States. The classifications in those statements are in greater detail than the above.

Rapid Increase in American Trade at Expense of Competitors

The *total* exports of industrial machinery from the United States to the Netherlands East Indies have been as follows, according to returns of the United States customs : 1910, $84,448 ; 1913, $410,634 ; 1915, $212,630 ; 1918, $2,171,062 ; 1919, $4,546,249 ; 1920, $3,962,705 ; 1921, $5,061,080 ; 1922, $291,731 ; 1923, $795,766 ; 1924, $1,454,854.

As can be seen by comparison with the table given above, the rapid increase in the volume of our machinery shipments to the Netherlands Indies does not represent any particular development of the industries in the Far Eastern archipelago. There has long been a substantial commerce of this sort with Europe, and, as war deprived these buyers of their usual sources of supply, a corresponding increase developed in the demand for American machinery. This is also illustrated by the following values taken from the returns published by the British Government, corresponding to the American experience just described; the figures show the total exports of industrial machinery from the United Kingdom to the Netherlands East Indies (converted at the par value of $4.8665 to the pound): 1911, $1,106,472; 1912, $1,649,135; 1913, $1,669,925; 1914, $1,725,422; 1915, $920,825; 1916, $1,361,939; 1917, $1,086,821; 1918, $530,867. (A change in classification makes it impossible to give figures for later years.) For the first three years the figures are for Java only.

Analysis of Netherlands Indies Figures

The figures presented in the foregoing statement give a rough idea of the demand for machinery in these islands and the way it has been sustained since the beginning of the century. The demand for machinery there is not new but is a well-established trade. These figures also show how the British have long supplied an important volume of such equipment to these buyers and how the American participation is a comparatively new development. These same facts are shown more clearly by the returns of the customs of the Netherlands East Indies as taken from a section different from that employed in preparing the foregoing tables, but constituting a detailed statement of the imports from each country and usually including two items relating to industrial machinery. These returns are presented in the following tables; it will be noted that they do not check with the foregoing returns, but apparently include all classes of imports as represented by the items in the table showing imports of machinery into Java and Madura, and therefore include hand tools, sewing machines, agricultural tools, and a number of other classes of equipment not covered by the writer's investigation. Also, electrical equipment is commonly included in the figures of the first table below. On the other hand, the classification "Machinery for sugar factories" appears to refer to machinery and supplies used in connection with sugar "centrals" and it will be remembered that, although this is the most important industry in the whole archipelago, it is all concentrated in the eastern part of Java.

ORIGIN OF MACHINERY IMPORTS INTO NETHERLANDS EAST INDIES

[Values expressed in thousands of guilders]

Years	Netherlands		Great Britain		Germany		United States		Japan	
	For sugar factories	Other*	For sugar factories	Other*	For sugar factories	Other*	For sugar factories	Other*	For sugar factories	Other*
1900 ...	2,876	4,664	1,012	1,231	—	175	4	46	—	—
1901 ...	3,279	3,416	462	1,025	4	188	1	186	—	—
1902 ...	1,553	3,433	163	606	12	355	13	60	—	—
1903 ...	938	2,502	143	684	37	291	2	46	—	—
1904 ...	1,821	3,267	264	700	39	327	10	86	—	—
1905 ...	3,802	4,634	455	1,074	194	298	3	121	—	—
1906 ...	2,700	4,792	527	740	440	651	11	103	—	—
1907 ...	2,334	5,534	523	1,238	668	730	14	111	—	—
1908 ...	3,646	8,232	844	1,727	287	1,023	3	113	—	—
1909 ...	3,326	5,473	608	1,006	365	821	1	91	—	—
1910 ...	2,931	7,423	797	1,237	515	1,316	4	208	—	—
1911 ...	3,457	9,107	869	2,322	440	2,181	7	257	—	—
1912 ...	3,371	12,032	1,660	3,792	675	3,085	21	284	—	—
1913 ...	3,590	16,881	1,178	3,388	827	4,668	1	508	—	7
1914 ...	2,572	11,999	709	4,200	630	2,728	7	727	—	—
1915 ...	2,650	7,944	373	2,511	24	533	21	924	—	310
1916 ...	3,191	7,927	563	3,339	1	66	272	2,628	—	350
1917 ...	1,791	5,473	643	3,135	—	18	390	5,765	—	1,616
1918 ...	235	1,848	287	1,765	—	19	363	5,545	—	3,158
1919 ...	3,180	17,190	633	5,608	5	287	705	19,224	—	1,231
1920 ...	3,904	—	878	—	304	—	216	—	3	—
1921 ...	12,444	19,235	2,606	12,156	1,208	12,426	584	11,346	3	167
1922 ...	8,114	13,702	831	12,072	1,440	6,951	30	2,346	5	97
1923 ...	5,226	8,193	598	3,708	308	4,343	48	2,037	8	47
1924 ...	5,986	12,204	975	5,309	631	6,048	142	4,968	—	39

*Includes electrical equipment.

TOTAL IMPORTS OF MACHINERY FOR SUGAR FACTORIES INTO NETHERLANDS EAST INDIES

[Values expressed in thousands of guilders]

Years	Total value	Percentage from— Netherlands	Great Britain	Germany	United States
1900	3,892	74.0	25.9	—	0.1
1901	3,746	87.7	12.3	—	—
1902	1,741	89.2	9.4	0.7	.7
1903	1,120	83.7	12.8	3.3	.2
1904	2,134	85.4	12.1	2.0	.5
1905	4,454	85.5	10.2	4.2	.1
1906	3,691	73.6	14.2	11.9	.3
1907	3,562	66.2	14.7	18.7	.4
1908	4,815	76.4	17.5	6.0	.1
1909	4,312	77.3	14.2	8.5	—
1910	4,290	69.3	18.6	12.0	.1
1911	4,813	72.4	18.4	9.1	.1
1912	5,749	58.7	28.9	11.7	.4
1913	5,780	62.2	20.4	14.3	—
1914	4,015	64.1	17.5	15.7	.2
1915	3,124	84.6	11.9	.8	.7
1916	4,027	79.1	13.9	.3	6.7
1917	2,824	63.5	22.4	—	13.8
1918	987	23.8	29.1	—	36.8
1919	4,683	68.0	13.5	.1	15.0
1920	5,321	73.4	16.5	5.7	4.1
1921	17,026	73.0	15.3	7.1	3.4
1922	10,461	77.5	7.9	13.8	.3
1923	6,226	84.0	9.4	4.9	.8
1924	7,829	76.4	12.4	8.0	1.8

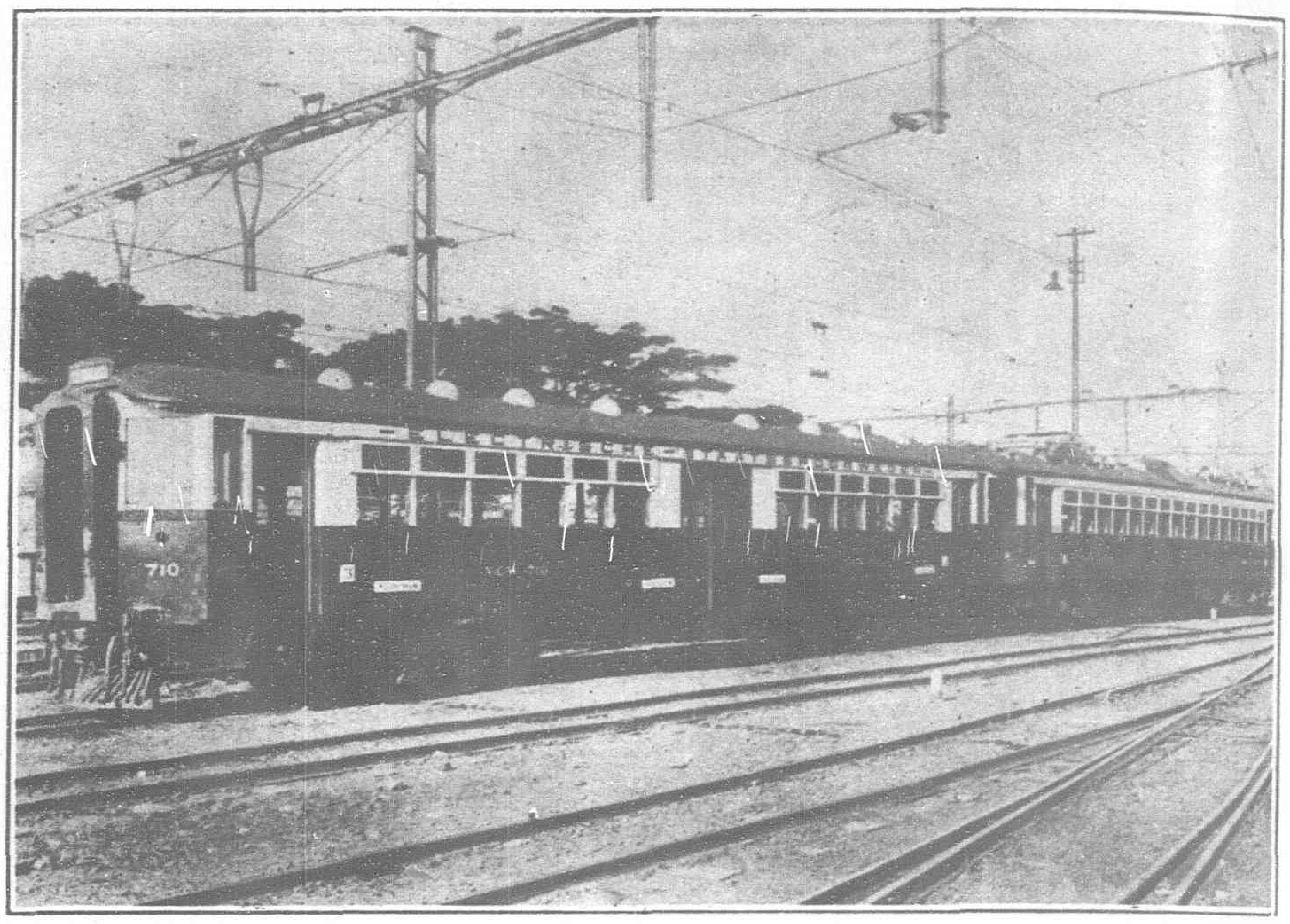
Note.—The above are only approximately correct.

The conclusions to be drawn from these figures regarding the sugar-machinery trade require no explanation, but it should be emphasized here that they do not express the price or engineering merit of American sugar machinery. The best sugar mills in Formosa, the Philippines, Hawaii, and Cuba are all equipped with American machinery, and these mills are far superior to those found in many other sugar-producing countries. The placing of American equipment in the sugar centrals of Java is a very nice sales problem, but will bring good returns to the successful manufacturer, because there are nearly 200 of these mills there, and many of them are now old if not obsolete, and maintenance if not replacement will necessitate very large purchases. During the war the importations of sugar-mill machinery fell below the pre-war level by many millions of guilders. If expressed in terms of weight instead of money, the deficiency would be found to be much greater. This deficiency should now be made up. But the potential business is far above the level these figures indicate, because they do not allow for any growth or development.

Corresponding to the table last given, which shows how the sugar-machinery business was distributed among the different countries of origin, the table next given shows how the other machinery trade of the whole archipelago was distributed. These figures include tools as well as machinery, and consequently are a little deceptive, but difficulties of this sort can be overcome at least in part by making comparisons with the figures published in the section "Detailed statistics of machinery imports," near the end of this pamphlet. From the next table one learns that by 1919 our machinery sales to these islands had expanded some 3,800 per cent. since 1913 and the United States had supplied them with more machinery than any other country. At first one is tempted to assume that Americans will now hold a position of pre-eminence in this business. But unfortunately the indications are that Americans will not be able to hold this position unless great improvement is made in the sales methods employed there. The tables given above and below are very interesting in that they show the rise and decline of German and Japanese participation in the machinery trade of these islands. However, judging by the amount of German machinery offered for sale in this territory from importers' stocks and by trade gossip, one is forced to the conclusion that the part played at present by German machinery manufacturers in the trade of the Netherlands East Indies is really larger than is shown either by Germany's export statistics or by the official import statistics of the archipelago.

Owing to conditions brought about solely by the World War, Japan became identified as a supplier of machinery to the Netherlands East Indies during the period of 1915 to 1918, reaching its maximum participation in the last-named year with 18 per cent. of the total imports of machines and tools, excluding sugar machinery, as the latter is not manufactured in Japan. Since 1918 Japan's participation has dwindled to 182,000 guilders, or a little more than one-half of 1 per cent. of the 1923 machinery imports. In contrast with the trade fluctuations of Japan and Germany it will be noted that the British participation has been remarkably uniform and consistent, like that of the Netherlands. Unlike Japan, the prospects are that American manufacturers will at least maintain their present volume of business, largely because the type of American machinery that is now entering the country sells itself.

With the exception of Belgium, which supplies only small quantities of machinery to the Netherlands East Indies, the United States was the only country which maintained its 1923 business practically at the same rate as in 1922. Upon referring to the



Train in the Muster Cornelis Yard.

American exports statistics in the latter part of this bulletin it will be noted that such items as mining, oil-well, and pumping machinery account for all but $80,351 of the total increase of $504,035 in 1923 over 1922. The same items are also responsible for an increase of $376,906 in 1924 over 1923, or over half the total increase of $659,088.

It was only natural, of course, that the imports of machinery should show a decided drop in 1922 and 1923 from the inflated figure of 1921 which brought in, on the crest of a wave of prosperity unprecedented in the history of these islands, a huge quantity of costly mechanical equipment. The market was flooded during the later years with a great variety of machinery, and imports were confined to equipment not in stock. As a matter of fact, a great deal of equipment on hand was altered or rebuilt in order to satisfy changed requirements and thus avoid the purchase of new machinery. It was found cheaper todo this and at the same time aid in the liquidation of stocks than it was to import. Happily, the liquidation of these overstocks was practically complete by the end of 1924 with the exception of high-grade machine tools.

The following table shows the total imports of machines and tools, including electrical apparatus (but excluding machinery for sugar factories), intothe Netherlands East Indies :

[Values expressed in thousands of guilders]

Years	Total value	Percentage from— Netherlands	Great Britain	Germany	United States	Japan
1900	11,305	41.3	10.9	1.5	0.4	—
1901	9,819	34.8	10.4	1.9	1.9	—
1902	7,255	47.3	8.3	4.9	.8	—
1903	5,497	45.5	12.4	5.3	.8	—
1904	7,558	43.2	9.2	4.3	1.1	—
1905	11,457	40.4	9.4	2.6	1.1	—
1906	11,323	42.3	6.5	5.8	.9	—
1907	12,352	44.8	10.0	5.9	.9	—
1908	16,980	48.5	10.2	6.0	.7	—
1909	12,527	43.7	8.0	6.5	.7	—
1910	15,627	47.5	7.9	8.4	1.5	—
1911	20,039	45.5	11.6	10.9	1.3	—
1912	26,412	45.5	14.4	11.7	1.1	—
1913	32,883	51.3	10.3	14.2	1.5	—
1914	25,133	47.9	16.7	10.9	2.9	—
1915	16,079	49.4	15.6	3.3	5.8	1.9
1916	19,940	39.7	16.7	.3	13.1	1.8
1917	20,974	26.1	15.0	.1	27,6	7.7
1918	17,448	10.6	10.1	.1	31.8	18.1
1919	55,648	30.9	10.1	.5	34.5	2.2
1920	61,194	45.9	16.8	11.6	20.3	1.4
1921	99,374	46.2	10.9	13.1	12.0	4.4
1922	38,432	36.9	10.6	19.2	4.7	5.2
1923	24,243	35.0	11.3	30.0	7.1	7.5
1924	30,913	39.4	17.2	19.6	16.0	1.2

Note.—The above are believed to be correct for the first three figures but may not be accurate beyond.

The foregoing table does not tell the complete story of this machinery trade, because it disregards the " machinery " imported via Hongkong, Singapore, and Penang, which is credited to those ports and not to the country of origin. For the sake of completeness these returns are shown in the table below, which indicates that this trans-shipment trade has developed to a volume of more than $1,500,000 per year, mostly via Singapore, and therefore probably mostly British. Probably it would not introduce serious error if the total of these shipments were credited to British sources, and this in turn suggests that the British have always had a stronger influence in this market than any other nation exept the Netherlands, and that their trade has been most regular. It is also worth noting that probably very little of the business represented by the following table is industrial machinery in the usual sense, because these heavy shipments usually go direct. Shipments from Hongkong and Singapore would commonly go to Borneo, Java, and islands farther east, while practically all of the shipments from Penang would be sent to Sumatra.

[Values expressed in thousands of guilders]

Years	Imports of " Machines and tools " to Netherlands East Indies via— Hong-kong	Singa-pore	Penang	Total	Per cent of total like imports
1900	2	710	189	901	8.0
1901	5	721	178	904	9.2
1902	3	846	110	959	13.2
1903	3	625	155	783	14.2
1904	5	852	120	977	13.0
1905	4	679	107	790	6.9
1906	5	821	371	1,197	10.5
1907	10	882	162	1,054	8.5
1908	23	528	130	681	4.0
1909	43	393	121	557	4.4
1910	16	673	109	798	5.1
1911	17	812	235	1,064	5.3
1912	40	785	163	988	3.7
1913	64	913	128	1,105	3.4
1914	31	648	130	809	3.2
1915	46	334	60	440	2.7
1916	26	1,020	80	1,126	5.7
1917	58	1,176	115	1,349	6.4
1918	41	2,075	114	2,230	12.8
1919	108	3,525	181	3,814	6.7
1920	63	3,387	103	3,556	4.7
1921	171	1,586	82	1,839	1.8
1922	56	703	31	790	1.8
1923	37	915	53	1,005	3.1
1924	38	699	64	801	1.9

The conclusion one reaches, is that before the war this market drew its machinery and supplies from European sources, and American equipment was practically unknown. It had never been represented in this market. It was not a case of comparative merit or price, but of a neglected market. British, German, and other manufacturers were well represented and had worked the market well. They had supplied vast quantities of equipment for the sugar mills, railways, mines, plantations, and other enterprises, but there had been no American salesmanship in the archipelago, although it is a very large territory, with a large population that is well governed and occupies possibly the most attractive territory on earth—a veritable paradise.

As for the future, the American manufacturer and exporter of machinery will find that his problem in this territory is to develop his business in a market which has long been established and occupied by others and in which he is not known ; a market where the ideas and ideals have been derived from continental Europe, although considerably influenced by the British, but where American machinery, American methods, American finish, American standardization, and American ways of conducting business are not appreciated even if known, and where much of the so-called " information " on these subjects that is in circulation is in reality misinformation.

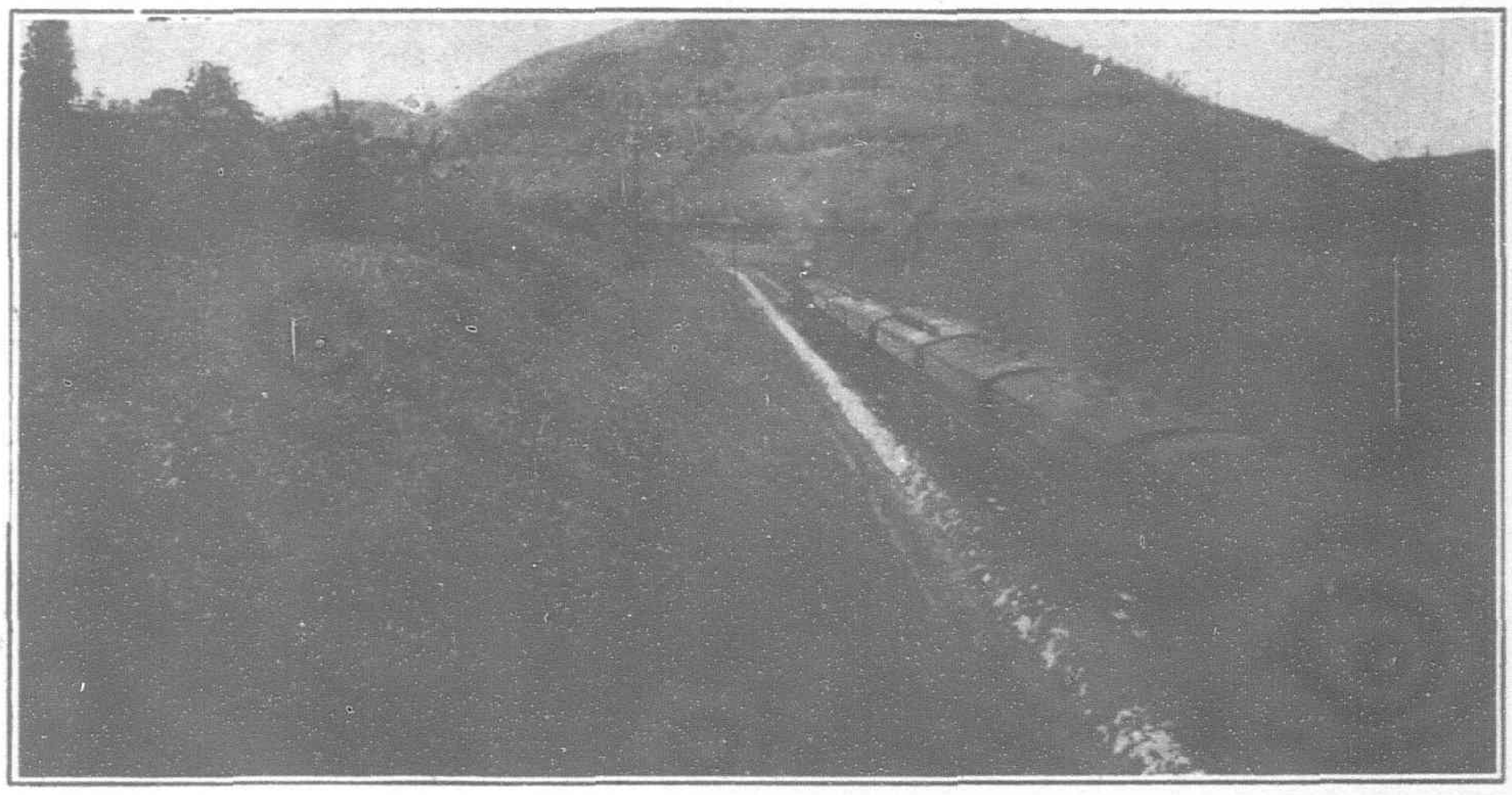
This archipelago is an interesting field that is receiving the attention of certain of our business men, and deserves the attention of others. American automobiles, cash registers, typewriters, and certain other lines of American machinery are becoming well known and highly appreciated. The Dutch, in both public and private enterprises, have found that frequently they can buy mechanical equipment in America to better advantage than in Europe. A number of the machinery dealers of Java have opened offices in the United States, and the colonial department of the Netherlands Government has opened a purchasing branch in New York. As a result, these offices have purchased many millions of dollars' worth of equipment for the archipelago. American machinery is now at work in connection with a great variety of enterprises in these islands—in the mines, the oil mills, the sugar mills, the petroleum fields, etc. American locomotives now operate on their railways and have been found so satisfactory as to be placed on the runs that involve the most severe service—with the best of results. American machine tools have established a splendid reputation for themselves there. Of the recent imports of automobiles, more than 90 per cent. are of American make. This wonderful group of islands constitutes a most desirable market, which Americans can develop with good results, but they constitute a sales problem of some difficulty and will ordinarily be found to require careful study.

Extent of Territory Included in Archipelago

Because most of our maps are on such a reduced scale, few persons realize the vastness of the Netherlands East Indies. Sumatra has 10 times the area of the Netherlands and the archipelago, in extending 3,200 miles from east to west, is considerably wider than the United States. Similarly the distance from north to south, 1,200 miles, compares with that from New Orleans to Canada. While it is true that a very great percentage of this total area is covered by the ocean lying between the islands, it is also true that the land area is very great.

Conditions Ideal for Tropical Products

Being so near the Equator, practically all of these islands have climatic conditions that are ideal for the cultivation of tropical products and at the same time escape the furious windstorms that occur in other latitudes. In these and many other respects the location is superior to that of the Philippines or Japan. Java ranks about third among the world's sugar producers if measured by the total quantity produced, but in the yield per acre it exceeds all others except Hawaii. Sumatra tobacco enjoys a unique reputation. Much of the world's quinine is from Java. There are many other products that testify to the woderful climate and fertility of these islands. These were the spices that fired the imagination of the people of Europe in the earlier centuries and induced them to venture out in the discovery ships of those days in search of riches and empire.



Express Train in West Java

Population and Productiveness of the Several Islands

While the whole archipelago is potentially wonderfully productive, vast areas are so inadequately populated that they are still left as jungle. In some very extensive areas the people are so primitive as to be of no economic value, and in some cases are so savage as to deter others from developing their territories. At the best the native people of these islands have very small purchasing power.

The total population of the archipelago is about 47,000,000, or about 45 per cent. of that of the United States, but the distribution is not at all uniform, as about 35,000,000 of these are concentrated in the two adjoining islands of Java and Madura, which are not quite so long as the distance from New York to Detroit and have a maximum width of 121 miles. The result is that these two islands ranks as one of the most densely populated countries in the world, while in contrast Borneo and New Guinea are vast areas lacking in population or given over to savages and can be developed only with great difficulty. The situation is indicated in the following table, from which one can see which areas are populated, productive, and developing, and which are backward and probably will continue so for some years :

Islands	Area	Total population 1905	Total population 1917	Population per square mile, 1917	Per cent of increase, 1905 to 1917
Java and Madura	50,554	30,100,580	34,157,383	676.0	13.5
Sumatra	161,612	3,447,330	4,317,232	26.6	25.8
Banca and surrounding islands...	4,446	115,189	154,178	34.8	33.8
Billiton	1,863	62,454	59,481	31.9	*4.8
Borneo (Dutch only)	212,737	1,233,655	1,515,503	7.1	22.8
Celebes and surrounding islands	71,470	415,499	2,352,048	33.0	466.1
New Guinea (Dutch only) ...	151,789	†200,000	†200,000	1.3	—
Other	81,928	2,170,838	4,447,814	6.3	91.0
Total	736,399	37,745,545	47,203,639	64.1	25.0

*Loss. †Estimated.

For convenience in estimating the significance of the foregoing figures a table giving the corresponding data for American States of corresponding size is added :

States	Area in square miles	Population, 1920	Population per square mile
New York	49,204	10,385,227	211.1
California	158,297	3,426,861	21.6
Oklahoma	70,057	2,028,283	28.9
Connecticut	4,965	1,380,631	278.1
Delaware	2,370	223,003	94.1
Texas	265,896	4,663,228	17.5

It thus appears that New Guinea, the largest island in the world except Australia and Greenland, having a total area of 312,329 square miles (that is to say, much larger than Texas), with soil and climate suitable for the production of any tropical crop, easily accessible to shipping, is destined to remain among the undeveloped places of the earth for want of a suitable population. Borneo, with a total area of 293,496 sequare miles, is in a very similar condition, although there has been some development there. On the other hand, Java (including the island of Madura, which is so close and so similar as to be almost a part of Java) is very densely populated with an industrious people who, taking advantage of natural conditions, have raised its productivity to a very high point. It is a wonderfully fine island—probably the richest colony in the world. But in considering the above figures and conditions generally, liberal allowances should be made for the small stature, physical weakness, illiteracy, and low purchasing power of these people.

A better idea of the rate of development of these different islands can be derived from the figures covering the changes in the European population in each during the same period. Java is now being developed very rapidly. Most of the available land is under cultivation ; increased production must come from improved methods, and the Dutch are very scientific. Obviously Sumatra is to be developed next, but Celebes and Borneo are receiving some attention, with the emphasis on the former. Banca and Billiton are given over almost entirely to tin mining. Figures for European population follows :

Islands	1905	1917	Percentage of increase
Java and Madura	64,969	111,430	71.5
Sumatra	7,208	13,057	81.1
Banca and surrounding islands	317	541	70.7
Billiton	281	368	31.0
Borneo (Dutch only)	1,382	2,448	76.9
Celebes and surrounding islands	1,572	2,436	55.0
New Guinea (Dutch only) ...	(*)	(*)	(*)
Other	5,378	8,601	59.9
Total	81,107	138,881	71.2

*Uncertain.

Industries of the Different Islands

Banca and Billiton

Banca and Billiton are two islands on the direct route between Singapore and Batavia and are very important producers of tin but have no other industries of importance. The operations in Billiton are in the hands of a private corporation. Those in Banca are a Government monopoly, and it has been suggested that Billiton will also pass under Government control when the present franchise expires, as it will in 1927. Tin was discovered in Banca in 1710, and from that time this island has been a noted producer, although more recently the Federated Malay States and Bolivia have shown greater production. The bulk of the metal is secured from placer operations, but there is also some lode mining in Billiton. The production has been :

Years	Banca *Short tons*	Billiton* *Short tons*	Years	Banca *Short tons*	Billiton* *Short tons*
1914... ...	15,954	5,084	1920... ...	15,039	8,453
1915... ...	14,874	5,792	1921... ...	16,649	12,698
1916... ...	16,319	6,561	1922... ...	18,716	11,884
1917... ...	15,183	7,154	1923... ...	19,360	12,313
1918... ...	13,285	7,654	1924... ...	21,574	12,758
1919... ...	13,654	8,360			

The placer mines on the above islands are said to be nearing exhaustion, and the decreasing production in Banca during the war suggests that there is some foundation for these reports.

This subject of tin mining is referred to more fully in the report on the Federated Malay States.

Dutch New Guinea and Dutch Borneo

Dutch New Guinea can be neglected, as there are no industries there that employ machinery. Dutch Borneo is in a somewhat similar condition, although there are some plantations on the island, some petroleum is produced, some diamonds are mined, and on the island of Pulu Laut off the southeast coast there is an important coal mine that is referred to again hereafter. Borneo is supplied largely through the markets of Singapore and is consequently removed from the present discussion.

Celebes

Celebes also has developed very little. There has been considerable newspaper talk about a body of iron ore that has been discovered there which seems to be associated with nickel and some other interesting metals, but unfortunately no adequate fuel supply seems to be available and the project depends upon either charcoal from the neighboring forests or water power from some sites that are available. The ports of Macassar and Menado handle the growing commerce, which is largely in copra, coffee, hides, spices, and other tropical products. There is a vegetable-oil mill at Macassar and a gold mine at Totok, but careful investigation shows that the imports of machinery are seldom in excess of $1,000 a year.

Sumatra

Sumatra is also relatively undeveloped but is progressing. Owing to its size and peculiar location it needs to be considered by sections. The western end (Atjeh, with a port at Sabang) and the so-called " east coast," with a port at Medan (Belawan), are on the trade routes connecting with the Straits Settlements at Penang and Singapore, so that this territory, and even to a certain extent Palembang, should be considered in the territory of merchants in the above British ports. It is in this part of Sumatra that the most important coal production has been developed, but even there the coal is scarcely better than a lignite and the quantity is not really large, although it is used on ships that take it on at Sabang, which has been equipped with coal wharves 1,400 feet long, storing sheds with a capacity of 25,000 tons, and five electric coal tips, each with a capacity of 80 tons per hour. The coal mines of this district are operated by the Government as a monopoly. In the east-coast region is a great plantation district forming one of the most noted tobacco districts in the world. Rubber and coconut plantations are also conducted on a large scale. Many of these plantations have British owners, but it stimulates the imagination when one learns that there is also an American rubber plantation of about 100,000 acres. Recently there has been a tendency to plant the African oil palm, and certain Belgian interests are active in it. The southeastern end of the island (the Lampongs) and the southwestern shore (Benkoelen, Padang, and Tapanoeli) should be considered in the territory of merchants in Batavia. At the same time this division of the island into two markets is not a hard-and-fast distinction, as different merchants handle the matter differently.

In addition to the usual tropical products which Sumatra produces in important quantities and which will continue to increase rapidly, the island gives promise of important possibilities as a producer of minerals. The coal operations at Ombilin have been mentioned. In 1919 the Government also took over a concession for the mining of coal at Boekit-Asem, which is not far from Lahat in the Residency of Palembang. It is planned to develop the colliery to a production of 100,000 tons per annum. Gold and silver are produced, the most important operation being in Benkoelen Province and also near Padang. Petroleum is produced in several districts in the northerly and westerly parts of the island. Near Benkoelen a small blast furnace is in operation producing charcoal iron, and the promoters hope to develop this to the point of meeting the requirements of the archipelago for pig iron, cast iron pipe, etc. In the mountains not far from Padang are sites that can develop a great deal of water power, and it was reported that certain of these are to be developed by Norwegian interests for the fixation of atmospheric nitrogen.

As in the other countries of Asia mentioned in this report, earnest efforts are being made to develop the Netherlands East Indies, and the indications are that these efforts will be centered in Sumatra for some years to come. Among the obstacles to this development is the lack of population—26.6 per square mile as compared to the 676 in Java. Also, the character of the population is not very satisfactory to those wanting laborers, and most of the plantations bring in coolies, largely from India and Ceylon. It is one of the strange anomalies of the Orient that although Java, at its nearest, is within 14 miles of Sumatra, earnest efforts have so far failed to persuade the people of Java to emigrate to this neighboring island, which offers so many more favorable opportunities. Those who have been working on this problem are reported to believe that they are on the point of success. It would be a fine thing for all concerned if this should prove to be true, and it would certainly promote the rapid development of Sumatra and better living conditions for the people of Java. As matters stand Sumatra is part of the territory supplied by the machinery dealers in Batavia, Singapore, and Penang, and the development of this island will increase the trade of these ports except in those cases where purchases are made direct in the markets of Europe and America.

Smaller Islands

The smaller islands of the archipelago, like Bali, Lombok, and Timor, have not yet shown important industrial development. Each is different from the others in many respects, and with the endless variations in geological conditions, animal and vegetable life, and, to a lesser extent, climate, fertility, and population, anything may develop. But as a present-day market for machinery Java is far more important than all of the others combined.

Java

As distinguished from the other parts of the archipelago, Java is densely populated and highly developed, especially agriculturally. With Madura it has an area about equal to New York State but is of very different shape, being 622 miles long, with a maximum width of 121 miles and a minimum of about 55 miles. In this area is crowded a population about a third as great as that of the United States, subsisting almost entirely on agriculture but also employing nearly all of the machinery imported into the archipelago. This island is extremely mountainous, having crowded into its area about 125 volcanoes, of which perhaps thirty are still active. Eruptions and earthquakes are frequent and in some instances very serious. But the more level country is very fertile, has abundant rain and a good climate, and is wonderfully productive. The principal machinery markets are Batavia, Soerabaya, and Samarang. Batavia is the capital of the entire archipelago and serves the western half of Java as a market. Because it is the capital, all of the Government departments are there, and business having to do with roads, railways, harbors, and mines for the whole archipelago centers there. It is also the center of the tea-producing district, in which there are about 300 plantations. The rubber-producing section, with nearly 400 plantations, also centers quite largely in this section. Cinchona (from which quinine is made) also centers here and is produced on more than 100 plantations. There are about 20 merchant firms in Batavia that sell machinery ; most of these are Dutch, but there are also German and British merchants. Some of these companies have large stocks of machinery and excellent showrooms.

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*Tin was also produced in Singkep, as follows : 1919, 803 tons ; 1920, 681 tons ; 1921, 792 tons ; 1922, 740 tons ; 1923, 932 tons ; 1924, 912 tons.

Soerabaya, near the eastern end of the island, is even more important as a machinery market, as it is the port for the sugar-producing district which occupies the larger part of this end of the island, extending almost to Samarang on the north coast. This sugar district is very important, producing a little less than 10 per cent. of the world's supply. About 375,000 acres are planted, which, allowing for rotation of crops, represents about 1,500 square miles of the best kind of agricultural land, which is handled in a most scientific way. The crop is handled in 211 sugar factories, about 180 of which may be classed as large " centrals," and the yield is about 1,500,000 to 2,000,000 tons of sugar per year. The largest individual—plant produced nearly 50,000 tons of sugar in 1918. Of the 177 factories that submitted reports on their operations to the Research Station Association of the Java Sugar Industry in 1919, 49 per cent. employed the ordinary defecation process, 38 per cent. used the sulphitation process, and 13 per cent. used the carbonation process. Of the factories that reported in 1918 about 47 per cent. produced white sugar and 53 per cent. raw sugar. There seems to be a tendency to produce whiter and better sugars, and this is creating a demand for improved equipment for the mills in Java. In all such matters the Dutch are very methodical and scientific and are deserving of the highest praise for the care with which they manage their enterprises. This is illustrated by the fact that they have increased the yield of sugar per acre from 6,294 pounds in 1894 to the levels shown by the following table :

Years	Number of factories	Acres under cane	Cane harvested: Long tons per acre	Pounds of sugar extracted per acre	Sugar extracted on 100 cane
1911	185	335,600	41.94	9,617	10.26
1912	184	346,800	41.53	8,910	9.63
1913	190	359,200	41.63	9,110	9.65
1914	186	366,000	40.87	8,495	9.28
1915	186	373,500	37.99	7,788	9.15
1916	186	385,290	41.11	9,238	10.03
1917	185	396,440	43.09	10,117	10.50
1918	186	402,943	38.44	9,723	11.19
1919	179	340,138	38.10	8,657	10.06
1920	183	385,647	37.34	8,826	10.55
1921	184	396,130	43,79	9,209	10.51
1922	182	397,443	47.23	9,861	10.44
1923	180	401,942	44.80	9,834	10.97
1924	180	424,945	47.52	10,365	10.91
1925	179	435,272	(*)	(*)	(*)

*Statistics not yet available.

These results are the best secured in any important sugar-producing country in the world with the possible exception of Hawaii.

As each of these plants represents a very heavy investment, the total sum represented by the sugar machinery in Java certainly exceeds $50,000,000 and probably amounts to more than double that sum. This equipment is imported through 10 or more of the ports of Java, as shown in the following table ; but the market centers in Soerabaya, though some of the business also goes through Samarang :

Ports importing " machines for sugar factories "	1913 *Guilders*	1915 *Guilders*	1918 *Guilders*	1919 *Guilders*	1920 *Guilders*	1921 *Guilders*	1922 *Guilders*	1923 *Guilders*
Soerabaya	1,823,915	1,189,902	681,980	2,595,735	2,375,513	8,025,753	3,473,570	1,623,805
Samarang	1,443,996	582,520	231,441	1,064,210	1,717,486	4,463,130	4,080,666	2,206,050
Cheribon	257,567	320,744	8,154	344,900	38,963	964,594	423,927	717,284
Tegal	792,136	69,674	9,600	305,966	452,773	1,693,572	1,884,387	539,859
Pasoeroean	193,441	135,923	49,660	289,714	416,376	380,137	82,645	—
Probolingo	220,650	181,498	6,065	38,543	185,427	43,899	11,500	74,401
Tjilatjap	805,042	579,702	—	23,556	45,883	—	—	—
Panarukan	154,110	31,381	—	14,969	54,102	665,970	161,553	869,387
Batavia	—	21,301	—	—	14,096	686,490	26,079	122,761
Pekalongan	89,348	11,540	—	—	20,220	94,196	317,120	66,612
Other	—	—	100	5,750	—	8,163	—	6,292
Total	5,780,205	3,124,191	987,000	4,683,343	5,320,839	17,025,904	10,461,447	6,226,451

In addition to its importance as a market for sugar machinery, Soerabaya also has important railway shops and dockyards and supplies engineering equipment for a number of vegetable-oil mills and the petroleum fields near Rembang in northern Java and those in southeastern Borneo. To supply all these demands there are in the city about 35 machinery merchants, whose stocks are even larger, whose showrooms are more attractive, and whose repair shops have better equipment and larger capacity than those found in Batavia. Of the above merchants, about a dozen are strong Dutch companies, several of which have branches in New York ; half as many are German ; three or four are British, also possibly having offices in the United States ; while the remainder are mostly comparatively small.

Samarang, on the north coast, about halfway between Batavia and Soerabaya, is less important as a market. It is so placed that it is close to the whole central part of Java and has a demand for the classes of machinery used at both ends of the island. There are about a dozen machinery merchants in the city, but practically all of these firms also have offices in Soerabaya or Batavia or both. Also, the volume of business done in these offices seems smaller than in the other cities.

Railways

Java is also the market where railway equipment is sold, even though it is used in the other islands. The Government railways included at the end of 1919 : Java, 1,559 miles of 42-inch gauge, 65 miles of 24-inch gauge ; Sumatra, 303 miles of 42-inch gauge, 318 miles of 30-inch gauge ; total, 2,245 miles.

Private railway lines—the so-called " tramways "—have been extended, until at the end of 1918 they totaled about 1,366 miles of different gauges (mostly 42-inch) divided among three principal companies. The total railway mileage, according to the above figures, is 3,611, but there is reason to believe that in addition to this there are certain short lines. There is one short railway line in Java that is of 4-ft. 8½-in. gauge.

In addition to the materials required by the above railways, a great deal of equipment is needed for the many plantation railways. The sugar industry creates a great demand for materials of this sort, and most of these plantation lines are of 24-in. gauge ; much of the line is portable and moved from place to place each year in order to reach the cane, which is grown on different areas in order to rotate the crops.

The following returns show the volume and origin of rolling-stock imports :

Years	Netherlands *Guilders*	United Kingdom *Guilders*	Germany *Guilders*	United States *Guilders*
1907	1,163,000	53,000	123,000	—
1908	1,625,000	38,000	142,000	—
1909	1,724,000	23,000	161,000	—
1910	1,879,000	17,000	382,000	2,000
1911	2,862,000	47,000	259,000	—
1912	2,875,000	147,000	286,000	4,000
1913	3,483,000	106,000	288,000	—
1914	4,179,000	24,000	429,000	25,000
1915	1,781,000	51,000	29,000	28,000
1916	1,011,000	15,000	—	180,000
1917	183,000	22,000	—	307,000
1918	34,000	31,000	—	1,216,000
1919	1,409,000	24,000	26,000	4,811,000
1920	2,903,000	79,000	579,000	569,000
1921	7,816,000	124,000	2,598,000	271,000
1922	2,804,000	10,000	1,536,000	77,000
1923	626,000	43,000	729,000	94,000
1924	*979,000	*2,000	*845,000	*7,000

*Java and Madura only.

Although they may not be strictly relevant in a report covering markets for machinery, the following figures giving corresponding particulars of the imports of rails, fishplates, and base plates provide further evidence of the position of American materials in this market and are also of interest because these materials are imported and marketed by the same merchant organizations that deal in machinery :

Years	Netherlands *Guilders*	United Kingdom *Guilders*	Germany *Guilders*	United States *Guilders*
1910	1,941,000	—	216,000	—
1911	1,501,000	—	220,000	—
1912	2,490,000	—	232,000	—
1913	3,434,000	—	131,000	—
1914	2,586,000	—	109,000	—
1915	1,566,000	—	52,000	185,000
1916	905,000	—	—	442,000
1917	108,000	—	—	989,000
1918	29,000	—	—	511,000
1919	661,000	—	—	6,259,000
1920	5,835,000	312,000	434,000	7,229,000
1921	6,396,000	136,000	3,319,000	3,537,000
1922	2,484,000	5,600	894,000	4,000
1923	849,000	10,000	989,000	—
1924	*1,158,000	*19,000	*529,000	—

*Java and Madura only.

Note.—By far the greatest part of this material is shipped to Soerabaya, and nearly all of the remainder goes to Samarang.

Roads

Java has an excellent system of good and well-kept roads, some of which were built possibly a century ago. As a consequence the automotive vehicle is of much greater service than in many other parts of the Orient. Owing to the mountainous nature of the country some of these roads are difficult in spite of the fact that they may be wide and well surfaced, as for example, the route over the Gedeh ridge a little way out of Buitenzorg, which has a 25 per cent. grade for possibly 2 miles.

In addition to the existing roads, which are numerous and excellent, there is a definite road program for the construction and maintenance of a system of trunk highways, the preliminary plan for which contemplated an expenditure of 24,000,000 guilders. Of this a little less than 1,000,000 had been expended at the end of 1918, all under the control of the central government. In addition to this there is a further system of provincial roads constructed and maintained under the provincial governments. Formerly these were under the central government, but they are being transferred and it is planned that by the end of 1927 this transfer will be complete. It is possible to travel about Java in an automobile with great comfort, and, as the landscapes are most beautiful, such a trip is very attractive.

In the other islands road building has made comparatively little progress, although a similar general road plan has been made for Sumatra and at the end of 1918 about 16,000,000 guilders had been so expended on a program estimated to involve 63,000,000. Other roads are being constructed in Celebes, Bali, Timor, Sumbawa, Sumba, and Flores. The large islands of New Guinea and Borneo have no roads of importance, but plans are being prepared for a system of highways in the latter.

Rice Mills

There are about 150 rice mills in the colony, most of which are in the hands of Chinese. The rice for local consumption is hulled almost entirely in the old primitive way. The existing mills are small, having capacities of from 7,000 to 35,000 pounds of hulled rice per 10-hour day. From what could be learned a fair amount of the machinery for this work was of American make, although there were a number of plants equipped by the German firms F. H. Schule and Huckanf & Buhle. There is a reasonable prospect that gradually additional small rice mills will be installed. Rice is grown very widely throughout the archipelago, but the greatest production is in Java and Madura, where the crop totals about 3,500,000 tons per year. It would seem that there is a distinct opportunity to improve upon the present ways of cleaning this food grain. As the quantity grown is insufficient, large quantities are regularly imported.

Coconut-Oil Industry

Although there are 226 coconut plantations in the Dutch East Indies, the largest part of the crop is obtained from the trees that are less systematically cultivated by the local people, and, as this production has been bringing them good returns, additional trees are bring planted. The yearly crop for Java and Madura is about 350,000 tons of copra from 37,000,000 fruit-bearing trees. As 26,000,000 more have been planted, the yield is expected to increase rapidly. The other islands produce about 380,000 tons, from 23,000,000 fruit-bearing trees. These figures were compiled in 1917. There were also 21,000,000 more, not then fruit bearing. Since about 1907 efforts have been made to extract this oil in modern factories, although no hydraulic presses were employed before 1910. In 1918 it was reported that there were 20 oil factories in Java using hydraulic presses, the total capacity of these mills being about 135,000 tons per year. Large extensions were planted, so that it is probably safe to estimate that this capacity now (1921) exceeds 200,000 tons of copra per year. Other plants have been installed in some of the other islands, such as the one at Macassar in Celebes, and it may be estimated that the capacity of these plants approximates 50,000 tons of copra per year.

Heretofore the cake produced by these mills has been used for fertilizer, but steps are being taken to use it for cattle feed. Also, in the past the copra has been dried in a primitive way, but certain of the oil-mill interests are experimenting with what might be called "drying houses." It is not yet possible to say what form of dryer will ultimately be adopted, but the subject is being studied, as the showers cause deterioration of the sun-dried product. If satisfactory dryers can be developed it is probable that the Government authorities will arrange to have them placed in the different producing districts. Serious efforts will be made to improve the grade of copra produced, not only in the matter of drying but also in making sure that only ripe nuts are picked. Strong interests are also trying to establish this industry on the best possible basis, and the indications are that this will be done with characteristic thoroughness.[‡]

There is also a large general demand for machinery. Many classes of industry are under consideration. Refrigerating plants will be added to the abattoirs in the leading cities. Pumps are needed for municipal and other supplies. An experimental weaving mill is to be installed. It is said that the railways of the archipelago will be extended until there is a total of 10,000 miles. Machinery as used in road making and maintenance is in great demand. It is reported that a cement plant is to be installed. The blast furnace for iron in Sumatra has been mentioned. It is expected that there will be a demand for 18,000 tons of cast-iron pipe per year, all of which is now imported. Projects for two pulp mills are under consideration. There are now about 20 sawmills in Java and 110 more in the other islands. Many of these are very small, but some are fairly large and use American machinery. Further demands for such equipment is anticipated.

Electrical Enterprises

Since 1910 the questions surrounding the development of the water power of the Netherlands East Indies have engaged the serious attention of the Government. In the beginning this problem was only viewed from the needs of the future electrification of the State Railways, but later on it was viewed in a broader sense, that is from a view point of a better supply of energy as the principal factor in the industrial development.

[‡] The writer is indebted for much of this information to "Olie Industrie in Neiderlandsch Indie," by B. Streefland, published in 1918.

Most of the electrical energy in the Netherlands East Indies is generated as three-phase alternating current at 50 cycles per second. Direct current is only employed in isolated private plants of factories and plantations and for traction. Single-phase alternating current is not generated but is employed for distribution in some cases.

The development of installed generator capacity measured in kilowatts is shown in the following table :§

Year	3-phase A. C., 50 cycles	Direct current	Other systems	Total
	Kilowatts	*Kilowatts*	*Kilowatts*	*Kilowatts*
1912	12,000	8,000	1,000	21,000
1917	32,000	15,000	1,200	48,000
1922	78,000	27,000	2,400	107,000
1924	*140,000	—	—	—

*Estimated.

Power generation and distribution areas in Java, the principal island of the Netherlands East Indian Archipelago, can be divided into three sections : West Java, Central Java, and East Java.

West Java.—The principal Government hydroelectric power stations are situated in West Java, one system serving the area of the Bandoeng Plateau, the other still in the process of construction, work having been begun on it in 1924. The last-mentioned serves Batavia and the whole area south of Batavia to the Indian Ocean. The Government generates and transmits the electric power and the G. E. B. E. O. (Gemeentelijk Electriciteitsbedrijf Bandoeng en Omstreken—Joint Electric Co., Bandoeng, and Environs) distributes it. This firm obtains the current from the Government at cost and the latter shares in any profits over 6 per cent. This organization has concessions for Bandoeng. Buitenzorg, Soekaboemi, and their environs—practically for the greatest part of West Java. Batavia is the big exception, this concession having long been held by the Netherlands Indies Gas Co. The Government sells electrical power to this company, while the 10,000-kilowatt steam power station of the latter assists during the dry period and at times of peak load.

Another consumer is the big radio station, Malabar, on the Bandoeng Plateau. The railways around Batavia which are in course of electrification will be another large consumer. Part of the equipment is being furnished by an American company.

The Government hydroelectric power plants are as follows :

Plangan : 40 kilometers south of Bandoeng. Completed October 1, 1922, with three 1,000-kilowatt units.

Lamadjan : South of Bandoeng, but a little north of Plongan. First installation two 6,000-kilowatt units, opened in 1924 ; designed for four 6,000-kilowatt units.

Bengkok : 8 kilometers northeast of Bandoeng. Completed September 1, 1923, with three 1,000-kilowatt units.

Dago : Northeast of Bandoeng. Completed September 1, 1923, with one 700-kilowatt units.

Oebroeg : 40 kilometers south of Buitenzorg, near Tjibadak. First installation two 5,600-kilowatt at end of 1924 ; designed for four 5,600-kilowatt units.

Kratjak : 18 kilometers west of Buitenzorg. Still under construction. First installation of two 6,000-kilowatt units to be ready by 1927 ; designed for four 6,000-kilowatt units.

The Government also has a 2,000-horsepower steam plant at Dajeuh Kolot, 9 kilometers south of Bandoeng, which acts as a reserve during the dry monsoon season, but is not likely to be used a great deal.

The Government power stations all generate at 6,000 volts, while for transmission 25,000, 30,000, and 70,000 volts are used, but power is all delivered at 6,000 volts. Some of the generating stations deliver part of their energy directly at 6,000 volts, and in other cases where the current is to be transmitted a long distance the whole is put directly on high-tension lines and stepped down by a transformer located at or near the point of consumption.

The whole program of expansion is largely dependent upon development of interest in the tea industry. The power already installed is ample for all possible needs for some years to come. On the Bandoeng Plateau the units already installed are capable of developing 24,000 horsepower, whereas the present consumption is only about 7,000. Electrical drying of tea and the extension of electric lighting of cities and the construction of light tramways as in other districts where power is available, are the objects of the Government as well as private companies. The campaign of the next few years will be for a more complete utilization of existing power rather than for the development of increased capacity.

Central Java.—The balance of Java is pretty well in the hands of the A. N. I. E. M. (Algemeene Nederlandsch-Indische Electriciteit Mij.—General Netherlands Indies Electric Co.). An important exception to this statement is the Solosche Electriciteit Mij., which has the concession for the Soerakarta district and whose power plant contains Diesel motors aggregating 1,250 kilowatts.

The big producer of the A. N. I. E. M. in Central Java is their Toentang River plant at Toentang, 30 kilometers south of Semarang, containing six hydroelectric generators with a total capacity of 4,000 kilowatts. It is the only A. N. I. E. M. plants using water as the motive power, the others being equipped with Diesel motors.

The Central Java power stations are as follows : At Semarang and Salatiga, hydroelectric of 4,000 kilowatts installed 1913 ; Djokjakarta, Diesel engines of 1,300 kilowatts, installed 1920 ; Magelang, Diesel engine of 450 kilowatts, installed 1924 ; Pekalongan, Diesel engine of 450 kilowatts, installed 1924 ; Tegal, Diesel engines of 400 kilowatts, installed 1921. In addition, plans are being formulated to build a Diesel engine plant of 400 kilowatts at Cheribon, as well as hydroelectric plants at Poerworedjo and Koetoardjo.

East Java.—As already intimated, the electric power concessions and facilities in this part of the island are generally controlled by A. N. I. E. M., which operates a large number of plants, with various types of equipment. An enumeration is as follows : Surabaya, a steam turbine plant of 10,750 kilowatts and a Diesel plant of 800 kilowatts ; Malang, Diesel engine of 1,550 kilowatts ; Pasoeroean, Diesel engine of 350 kilowatts ; Kediri, Diesel engine of 450 kilowatts.

The Government operates a hydroelectric plant of 2,000 horsepower at Giringan on the Tjatoer River, which supplies current to the State Railways workshop and the municipality of Madioen, between Soerakarata and Kediri. There are other private companies holding lighting and power concessions and operating plants in Java, but they are few and unimportant.

In connection with the electrification of the State Railways, another big scheme is the electrification of the Wonokromo-Bangil (near Surabaya), the accomplishment of which the Government also considers urgent. The current will be supplied by the Kali Konto hydroelectric station to be erected within a period of two to three years and which it is proposed should be run jointly by the Government and A. N. I. E. M. The construction will involve an expenditure of seven to eight million guilders. It is planned to transmit power at 70,000 volts to Surabaya, a distance of 90 kilometers, and to other places where supply companies, principally the A. N. I. E. M., will distribute the current.

According to a rough estimate, Java will need in 1930 the following electric power, measured at the power stations : 31,000 kilowatts for lighting purposes ; 13,000 kilowatts for power purposes, not including electric traction and big industrial undertakings.

Outer districts.—In the outlying districts matters have in no way reached the stage of development witnessed in Java. Among the comparatively few plants in this territory are the following : Privately operated plants at Pontianak, Bandjermasin, Medan (3,000-kilowatt steam plant), and Macassar (1,500-kilowatt steam plant), and a Government steam plant at Padang (2,000 kilowatts) which supplies power to the coal loading equipment at Emma Harbor, to some factories, and to the municipality of Padang.

Other Industries

It has not seemed practical to submit a list of the different industrial enterprises in this archipelago ; not only would the list be long and complicated, but it is easy to convey an inaccurate impression. For example, the West Java Engineering Works, near Buitenzorg, advertise that they will build bridges and other forms of structural steel work, including buildings for tea and coffee plantations, etc., and a visit to the plant shows that they are equipped to work up about 10 tons of steel a dy, but when the writer was there it was found that, although they could punch up to a 1-inch hole in a half-inch plate or shear a 6-by-6 angle no power was used in the plant. The tools used were all hand-power types imported from Germany.

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§From a paper by C. D. Volker, M. N. R. L. E., electrical engineer, Government Bureau of Water Power and Electricity in the Dutch East Indies, which was read before the First World Power Conference held in London in 1924.

This incident raises the old and much discussed topic of offering types of machinery wanted by a buyer rather than offering standard types. Nothing could be further from American standards than the equipment found in this neat and successful little shop; if it is necessary to produce such machines to enter the machinery trade of Java, no American manufacturer will find it worth while. On the other hand the indications were that this little plant would soon install a complete power-driven equipment.

Fuel

Industry in the Netherlands East Indies is handicapped by its fuel problem, just as it is in so many other parts of Asia, though conditions here are not so extreme as in some of the other districts. The archipelago produces a good deal of petroleum, and the usual products are obtained by refining, but even with these supplies, which are often used in Diesel engines, and despite the fact that some coal is mined in the archipelago, fuel is also imported from Japan and Australia and even from Cardiff. It seems a little strange that coal should be obtained from such widely scattered fields, especially when it is known that large quantities of good coal lie in Bengal and Kwangtung.

In 1914 Cardiff coal was on the market of Java at prices from $7.60 to $10.40 per long ton. Coke could be secured at $14.50 to $17.20 per long ton. In 1918 these fuels were off the market. Japanese coal was offered at $28 per ton c.i.f. Soerabaya. At the same time Australian coal was $30 per ton and Borneo coal $12, to $15.

The coal consumption of the Dutch East Indies is about 800,000 to 1,000,000 tons and is rapidly increasing. The following tables show imports and local production:

COAL IMPORTS OF JAVA AND MADURA

Source	1914 *Tons*	1915 *Tons*	1916 *Tons*	1917 *Tons*	1918 *Tons*	1919 *Tons*
Australia	222,000	111,000	40,000	13,000	8,000	56,000
Japan	75,000	137,000	137,000	61,000	88,000	32,000

Source	1920 *Tons*	1921 *Tons*	1922 *Tons*	1923 *Tons*	1924 *Tons*
Australia...	103,000	283,000	154,000	82,000	71,000
Japan	51,000	105,000	53,000	70,000	12,000

The total production of coal of the Netherlands East Indies for the inclusive years 1914 to 1924 was as follows:

	Tons		Tons
1914	683,470	1920	1,095,439
1915	680,911	1921	1,211,465
1916	823,694	1922	1,031,936
1917	832,129	1923	1,156,625
1918	833,082	1924	1,470,362
1919	949,670		

In addition the following lignite was produced: 1920, 279 tons; 1921, 1,200 tons.

Considerable difficulty is being experienced in increasing this production. Also, the quality of the imported as well as the domestic coals is not satisfactory; they are friable, high in volatiles, and high in ash. Steam economy is very necessary in this territory, and efficiency should be emphasized in furnace design. There are a few water-tube boilers in use, but for common service, especially in the sugar mills, the type ordinarily adopted is the so-called "elephant boiler," which is practically a return tubular boiler perhaps 7 feet 6 inches in diameter and 18 feet long with a separate overhead steam drum 2 feet 6 inches in diameter and 9 feet long, and two separate mud drums placed diagonally, each 2 feet 6 inches in diameter and 21 feet 3 inches long, separated 4 feet between centers.

It cannot be emphasized too strongly that no boilers should be sent to the Dutch East Indies unless they are especially built to meet the requirements of the local law covering construction, inspection, and operation. This so-called Java steam law differs from the usual American practice but is strictly enforced. In a recent paper presented before an engineering body in Java, Mr. A. Kovring, an engineer in the steam-engineering department of the Netherlands East Indian Government, showed how in a given instance the American rules would allow a working pressure of 158 pounds per square inch, while in Java the conditions might be such as to reduce this to 116 pounds. Undoubtedly this is an extreme instance, but there are many American boilers in Asia operating at reduced pressure because of failure to comply with the local laws. This is not merely a question of superior engineering, for in most instances the American practice is far more up to date. Very commonly these laws in Asia are not framed to recognize quadruple-riveted joints or spring-loaded safety valves, and since they are still in force the user finds it necessary to comply with them.

Steam Boilers

According to the division of commerce there were 2,148 factories in Java and Madura and 703 in the outer districts at the end of 1922, making a grand total of 2,851, operating under the supervision of the so-called "security ordinance," which is in effect a factory-inspection measure.

The following tables show the various countries that supplied boilers to the Netherlands East Indies during 1922 and 1923, as well as the number of steam boilers in use on December 31, 1923:

ORIGIN OF NEW BOILERS INSTALLED IN 1922 AND 1923.

Country of construction	1922		1923	
	Number of boilers	Heating surface *Sq. meters.*	Number of boilers	Heating surface *Sq. meters*
Netherlands	85	14,633	68	10,559
Netherlands East Indies	5	341	—	—
England	58	3,512	62	2,822
Germany	115	8,472	107	9,924
United States...	39	1,603	6	1,003
All other	11	351	8	199
Total	313	28,912	251	24,507

STEAM BOILERS IN USE ON DECEMBER 31, 1923.

Classification	Java and Madura		Outer districts	
	Number	Heating surface	Number	Heating surface
Land boilers in use by private individuals and concerns:		*Sq. meters*		*Sq. meters*
On sugar estates, stationary ...	1,336	304,138	—	—
On sugar estates, locomotive ...	576	12,486	—	—
On coffee and rubber estates ...	171	2,571	61	1,698
In rice hulling plants	109	6,686	15	422
In oil factories	157	4,320	53	2,840
On petroleum establishments ...	150	6,215	614	24,177
In pumping stations	108	2,795	280	7,871
On road rollers	284	1,875	92	538
All other	655	25,737	515	21,792
Total	3,546	366,823	1,630	59,338
Ship's boilers in use by private individuals and concerns	429	54,962	291	12,143
Locomotive boilers of private railways	598	24,515	60	4,150
Government land boilers	258	4,489	681	15,085
Government ships boilers	120	8,232	20	1,601
Land boilers of the State Railways ...	198	2,088	—	—
Ship boilers of State Railways ...	5	224	—	—
Locomotive boilers of the State Railways, in Java and South Sumatra...	679	57,094	—	—
Total	2,287	151,604	1,052	32,979
Grand total	5,833	518,427	2,682	92,317

The important part which fuel power has played and is still playing in the development of the country may be deduced from the following. statement:*

The mercantile home fleet comprises 230 steamers with a total tonnage of 270,000 registered tons.

The total length of railroads amounts to 6,628 kilometers (4,150 miles) with an invested capital of 650,000 guilders (£54,000,000).

The annual turnover of the earth oil industry amounts to 140,000,000 guilders (£11,600,000).

The total number of boilers in commission, excluding those owned by the Government and the railway companies, during the year 1922 was as follows: Stationary boilers, 5,200 heating surface 420,000 square meters; marine boilers, 720, heating surface 64,000 square meters; total, 5,920 steam and stationary boilers with 484,000 square meters of heating surface.

The total fuel burned during the year 1922, in metric tons, was as follows: Coal, 1,160,000 tons; bagasse and other agricultural waste products, 4,600,000 (used by sugar mills); wood (teak and jungle wood), 740,000 tons; furnace oil, 419,000 tons; motor oil, 49,000 tons; gasoline, 85,000 tons. (No data was available relative to the consumption of gas.)

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*From a paper by D. J. L. Coninck Westenberg, chief engineer at bureau of mines, Batavia, which was read before the First World Power Conference, held in London in 1924.

(Continued on page 384).

THE Osgood Company manufactures a complete line of excavating machinery and has a background of more than fifty years experience in this line of equipment.

Standard or railroad shovels are made in various sizes with dipper capacities ranging from 1-1/2-Yd. to 6-Cu. Yd. and these machines can be furnished upon either standard railroad tracks, traction wheels or continuous tread mountings.

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Machinery Markets Netherlands East Indies

(Continued from page 382).

Aproximately 180 sugar refineries are at work, producing yearly 1,500,000 tons of sugar, which at an average selling price of 260 guilders a ton, amounts to 390,000,000 guilders (£32,500,000).

The total production of tin mined during the year 1923 amounted to 28,000 tons, representing a value of almost 72,000,000 guilders (£6,000,000).

Diesel Engines

From the lists of electrical enterprises one can make an estimate of the extent to which Diesel engines are employed. A certain firm in Soerabaya claimed to have sold more than 50 Diesel engines ranging in size from 50 to 600 horsepower each. Figures showing the number of oil engines exported from the United States have already been given. A great many British engines are also in service, the figures being: 1915, $82,275; 1916, $153,580; 1917, $69,665; 1918, $40,360; 1919, $102,447; 1920, $118,228.

It is possible that these figures include some Diesel engines, as many British Diesel are in service, but one gathers the impression when visiting the territory that there are also a great many British semi-Diesel engines at work.

Water Power

Under existing conditions it is obviously desirable that the waterpower resources, especially in Java and Sumatra, be developed as fully as possible.

Of special interest in this connection is the following excerpt from a paper by A. Groothoff, A. M., chief engineer, Department of Government Industries, entitled "The Water-power Resources of the Dutch East Indies," which was read before the First World Power Conference, London, 1924:

> While the systematic surveys and investigations necessary for a thorough and accurate report on the water-power resources of the Netherlands East Indies have not yet been completed, an estimate of the total available water-power resources of the five principal islands (Java, Sumatra, Dutch Borneo, Celebes, and Dutch New Guinea) places the minimum capacity at approximately 8,000,000 brake horsepower (the efficiency of hydraulic installation being assumed to be 75 per cent). This is almost the absolute minimum, which usually is of such short duration that it would not be profitable to develop a water-power scheme on this basis. It is, however, common practice to estimate the continuous power for nine months, which would place the available hydroelectric energy at about 12,000,000 horsepower, or 50 per cent. more.
>
> The above estimates do not include the storage possibilities of lakes and reservoirs. Moreover, a maximum development of the available water power may be possible in connection with auxiliary fuel-power plants, which supplement the deficiencies during the dry season. With all practicable storage sites utilized and the water properly spplied, there might be possibilities for the development of at least 15,000,000 horsepower of hydroelectric energy.

Of the foregoing possibilities, definite projects have been made for the following: Java, 85,000 horsepower; Sumatra, 325,000 horsepower; Borneo, 100,000 horsepower; Celebes, 150,000 horsepower; total, 660,000 horsepower.

These figures represent only preliminary studies for proposed plants for a variety of purposes, including nitrogen-fixation (fertilizer) plants, mining enterprises, steelworks, railway electrification, etc. Nitrogen projects involving at least half a million horsepower are under consideration in Sumatra, Borneo, and Celebes.

Janus Springs

In addition to the construction of lifts, with which their reputation is mainly associated, Messrs. Smith, Major & Stevens Ltd., of Northampton, are also makers of "Janus" Door Springs and Checks.

An interesting example of the soundness of design and construction of these Springs has recently been afforded. A "Janus" Spring was recently sent for repair by the owner to Messrs. Smith, Major and Stevens. From the number on the cover plate it was obvious that the Spring was over 50 years old. Interest being aroused by this discovery enquiries were made of the owner to learn whether any previous repair had been made. These enquiries elicited the fact that the Spring had not been touched in any way throughout its half a century of service. Messrs. Smith, Major and Stevens have been manufacturing "Janus" Springs for over a century. There could hardly be a more convincing testimony to their reliability and durability.

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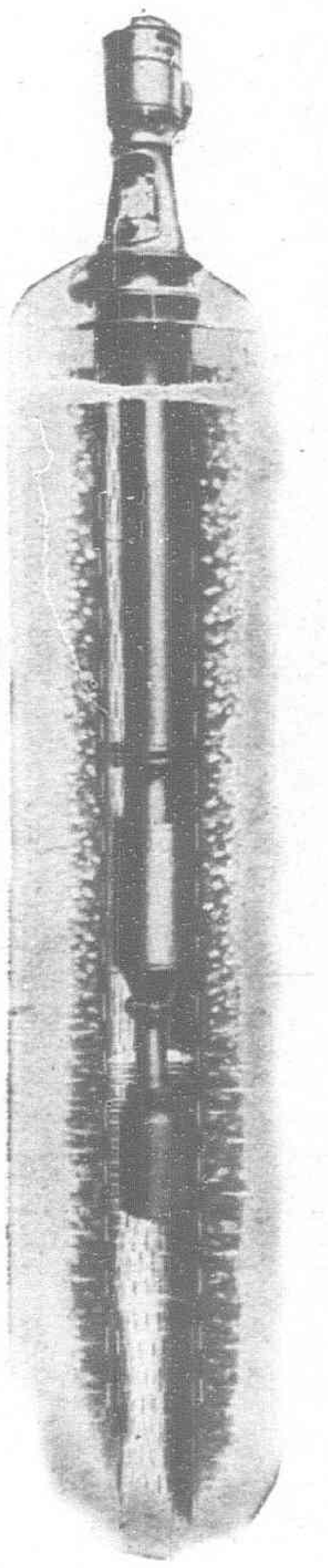

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